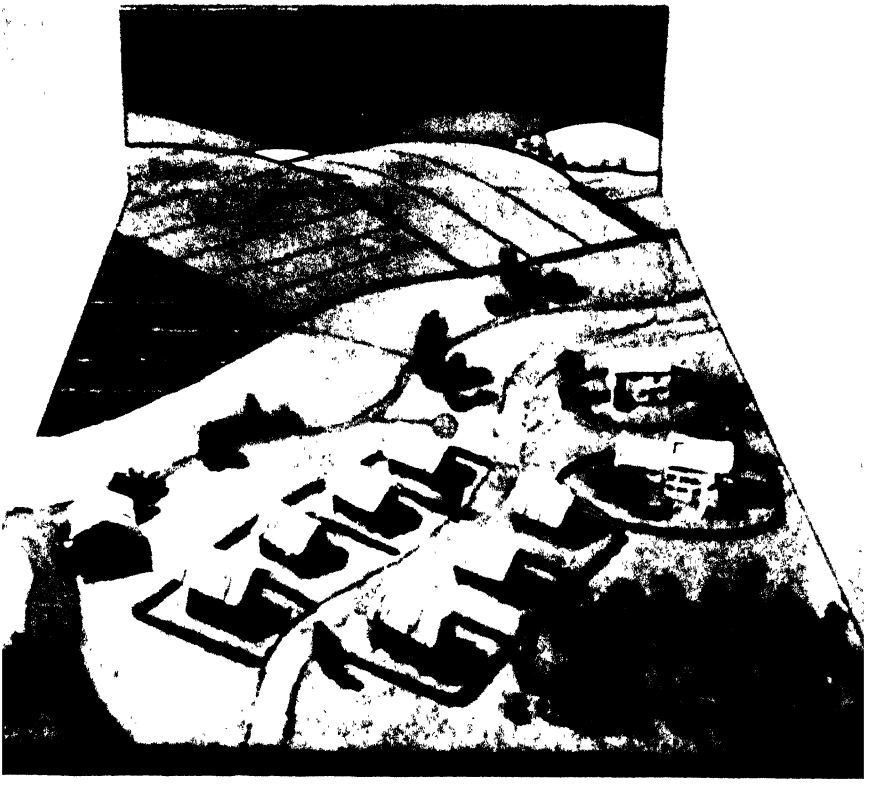
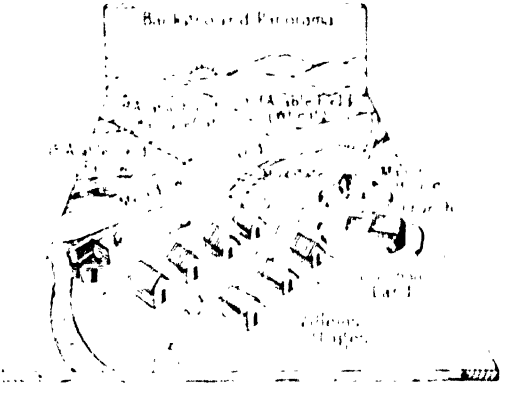
ILLUSTRATIVE MODEL-MAKING





A SAXON VILLAGE

This quickly made model shows the chief features of a village in the late Saxon and Early Norman period. The three arable fields divided into strips, the meadow land by the river and part of the common grazing land can be seen. It is built on a base 5 feet by 4 feet.

ILLUSTRATIVE MODEL-MAKING

by

L. EVANS

HEADMISTRESS, RYLAND ROAD PRIMARY SCHOOL, BIRMINGHAM

and

J. T. UDALE

With an Introduction

by

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ACKNOWLEDGMENTS

WE wish to acknowledge our indebtedness to all our colleagues on the staff of Ryland Road Junior and Infant School, Birmingham. We owe them our sincere thanks for their keenness, their interest in this type of work, their willing co-operation, and for many original ideas; without their generous help this book could not have been produced.

We also tender our thanks to Mr. F. J. Petherick, Headmaster of Clifton Road Junior School, Birmingham, and late of this staff; to Miss H. Raward, of Cherrywood Road Senior Girls' School for the work shown in Plate XX; to Mr. R. W. Talbot, Headmaster of Golden Hillock Road Senior Boys' School, Birmingham; to members of his staff and to his boys, who provided the model shown in Plate XIII; and to Mr. L. A. T. Grose, of Elkington Street Handicraft Centre, Birmingham, for having given ungrudgingly of his time and ability in connection with the photography of all the models except those in Plates III and XIX and the Frontispiece.

Finally we must express our gratitude to Mr. A. F. Collins, B.Sc., Inspector of Handicraft and Science, Birmingham, at whose suggestion this book was written, for writing the Introductory Chapter.

L.E.
J.T.U.

BIRMINGHAM,
December, 1938.

INTRODUCTION

MODEL-MAKING IN THE SCHOOL OF TO-DAY

THE CHANGING SCHOOL

DURING the last decade we have seen a considerable change, not only in the organization of schools, but also in the nature and extent of the activities of the children in them.

Formerly school work was largely a matter of the teaching of "subjects" through exposition by the teacher to a class of seated children, at carefully arranged times which were rigidly observed. The pupils' activity was in the main confined to the answering of questions, to reading, writing and occasionally to drawing. Music, handwork in varying measure and physical training played a relatively minor part in school life. To see a class freely engaged in purposive and varied, rather than regimented, activities, was the exception and not the rule save in infant schools.

The freedom and the development of individuality which then characterized the best infant schools is now widely influencing the junior and senior departments. There is an ever-increasing tendency to unify the curriculum, to break down the artificial barriers between the subjects, and to obliterate the sharp division between academic and practical work. This merging of the subjects into one another, and its inevitable concomitant, the subordination of the rigid divisions of the time-table to the needs of the work in hand, together with the tendency to utilize practical work and material illustration to the full, may perhaps be best seen in what is now generally spoken of as the "Project Method" of teaching.

Among the various features of the new approach to learning, with its amazing increase of activity by the children, and the widening opportunities it offers to them to express themselves

in various ways, model-making plays a prominent part. Along with such activities as dramatization, puppetry, choric speech, rhythmic movement, percussion bands, the new freedom in art and the development in crafts, model-making now takes its place as an important outlet for self-expression and communal and social training.

INTEREST AND EXPRESSION

"Pictures and models will naturally abound in schools which recognize the child's compelling interest to make things." (*Handbook of Suggestions for Teachers*, 1937.)

It is in the last few words of this quotation that we find the fundamental reason for encouraging model-making in schools.

Anyone who is frequently with children cannot but have noticed that from their earliest years they exhibit a desire to express themselves, not only in speech and in muscular action but also in those activities which in later childhood develop into various arts and crafts. In a word, every child has a natural urge to "make things."

The aim of education is harmonious development—to make "Jack" the best "Jack" that he can be—and this impresses upon us the necessity of providing, among other things, the widest opportunities for every form of self-expression. Among these forms, model-making can justly claim a place.

Children delight in doing it; it employs a wide diversity of media and processes and gives the utmost scope to ingenuity and invention; and its practice can be so organized as to allow both for individual and communal work. This last is one of the outstanding values of model-making; few other forms of expression, except perhaps dramatic work, can equal it in the opportunity it affords for the encouragement of a large number of diverse individual efforts, and the bringing of these together into an attractive whole to which each is subordinated. Each child can exercise to the full his own need for self-expression, except that he willingly submits to work within the limits of size, colour, finish, etc., which he, in discussion with his fellows,

has decided are necessary in the finished model. Herein lies the discipline of communal effort.

MODEL-MAKING AS A CRAFT

The making of models is no new thing. Dolls and models of animals have been made from very early times, and some of our knowledge of past civilizations is gained from highly realistic models, showing scenes of everyday life, which have been preserved long after the original subjects have perished, and many of which, seen in our museums to-day, impress upon us the debt that we owe to these earliest model-makers for the vivid pictures they have left to us of life in their own days.

Nor has this urge to make models lessened with the passage of time. Considering the mechanized age in which we live, with its temptation to escape into easy and ready-made amusement, it is remarkable how often we see models of ships, machinery, buildings, towns and a multitude of other things, which have been made by people in all walks of life simply for the satisfaction of making them.

Moreover, models have many uses in the industrial and professional world of to-day. Architects, ship and aircraft designers, engineers, stage designers, film producers, are but a few of those who find models invaluable in their work.

Thus model-making can be developed from the simplest beginnings into a craft with a highly-organized technique which demands all the skill of the most competent craftsman, and which may result in such remarkable achievements as the Queen's Dolls' House.

In schools, the range of model-making may extend from the simplest and crudest efforts of the youngest children in the nursery and infant stages, satisfying to their makers because of the imaginative life with which they endow them, to beautifully accurate and detailed representations made by senior boys and girls, with such skill that they give considerable satisfaction even to the adult eye.

In this progression we can mark the steady growth of skill, accuracy and artistic finish

The criteria by which we may judge of the fitness of a craft for inclusion as an instrument of general education may be set out as follows:

(*a*) Does it contribute to the character-training of the pupil as an individual, and afford opportunities for social training, e.g., in communal work?

(*b*) Does it make some contribution to the pupil's intellectual development?

(*c*) Does it encourage appreciation and discrimination in matters of appearance and finish?

(*d*) Does it spring from a fundamental need or impulse of man's nature, and so have its part in the stream of cultural tradition?

(*e*) Can it enrich the life of the individual pupil, and of the community (school or family) of which he is a member?

(*f*) Does it involve the acquisition of useful skills and facts, and a practical experience of the properties of various materials?

(*g*) Is it within the physical powers of the pupil?

(*h*) Can it be practised effectively under normal school conditions, and with equipment and materials which are easily obtained, and which are not so costly as to alienate public opinion?

It must not be thought that the foregoing list is exhaustive, or is intended to enumerate qualities which can be isolated in "watertight compartments" and which are mutually exclusive, but if, when considering a craft for school use, "yes" can be answered to these questions, a strong case can certainly be made for adopting that craft as an educational factor.

How does model-making answer these requirements?

It demands of the pupil patience and perseverance; the courage to "carry a job through" realizing that even if there are periods of comparatively uninteresting work, they are worth while because this is the only way to achieve the projected end. It fosters habits of cleanliness, order, system and accuracy in dealing with tools and materials. It encourages self-reliance and the capacity to work independently in gradually increasing

measure. It affords opportunities for a child to work pleasantly and unselfishly with his fellows towards a communal aim.

If properly directed, model-making calls for and develops the following qualities among others: The imaginative comprehension of an aim or of an instruction; ingenuity and invention; forethought; skill in planning and calculation; an understanding of proportion in deciding the sizes of various parts; and, following discussion and study, a discrimination and judgment in deciding what is possible to be done. This last involves much clarification of ideas.

Does this craft encourage appreciation and discrimination in matters of appearance and finish? Obviously it does, for throughout the making of a model the child must constantly question himself—will this look right?

As has already been said, model-making has a sound historical tradition, and is still a vital activity in modern life.

There is no doubt that it can enrich the life of the pupil and of the school community—in fact, it may well develop into a most useful school service, especially in the form of illustration, and as a powerful educational instrument in "Project Method." Of these matters more will be said later. Model-making, more than many crafts, is particularly popular and practicable as a home activity—a hobby. The pupil may often experiment at home with various media not easily to be obtained in school, and bring the result of his work to add individual and interesting detail to the communal model.

There is probably no other craft in which the worker is brought into contact with a wider variety of materials, or in which he may acquire more diverse skills.

As may be seen from the examples described and illustrated in this volume, models can be made which are well within the physical powers of the pupils at any stage of school life.

Model-making in schools requires very little expenditure on tools and materials, and it is essentially a classroom craft, that can be carried on under normal school conditions without needing special furniture or equipment.

Thus it can be said that there are strong reasons in favour

of including model-making as a craft in the curriculum of the modern school. Whether, considering it simply as a craft, these reasons justify its choice as among other crafts with perhaps equally strong or stronger claims, must be a matter for decision in the light of local circumstances.

But this is not all.

MODEL-MAKING AS ILLUSTRATION

Though much has been said in favour of model-making for its own sake, its influence in the modern school can extend far beyond its value as a craft, great as that may be. Indeed, even if it is not adopted and practised consciously as a craft, it may, and should, still be widely used in schools because of its value as a factor in learning—i.e., because of its value as *illustration*. Such use sets "Illustration-value" as the first essential. "Craft-value" will still exist, but only as an incidental to the primary aim—that of illustrating and making vivid the ideas which arise in the study of various subjects of the curriculum.

> ". . . the making of models out of suitable material may often contribute most usefully to a child's study of the subject presented to him." (*The Primary School Report*, 1931.)
>
> "The expression of ideas in a wide variety of media is generally considered to be best associated with the illustration of geography, history and literature." (*Handbook of Suggestions for Teachers*, 1937.)

Model-making pursued in this spirit—primarily for its value as illustration—will probably make the widest appeal to all types of schools, whether or not they also decide to develop its technique along the lines of definite craft teaching.

Experience shows that model-making of this kind certainly appeals to all types of children, and that it is especially valuable in engaging the attention of the "difficult," restless, active pupil who, though not "slow," exhibits little aptitude for, or interest in, book-learning. Indeed, this activity may sometimes stimulate such pupils to an interest in book-learning, and reveal in them a latent aptitude for it. This is perhaps most noticeable

when illustrative model-making is used as a part of the project method.

Many children, and indeed adults also, find it very difficult to form a mental picture of something that is described verbally to them, and it is of course a commonplace that in teaching such subjects as history, geography and literature, full use of pictorial illustration is made. It is interesting to speculate how much the use of films, now being widely adopted as teaching aids, will contribute to this clarification of ideas, but whatever may be the value of the "moving picture" as an illustration, it is still a *picture*; moreover the child plays no part in its production.

Thus the model has two advantages over the study of pictorial illustration—static or moving—it is *three-dimensional*—"solid" and not "flat"—and *it can be made by the children themselves*—they gain from it an outlet for their urge to create. (I do not propose here to enlarge upon the very great value of picture-*making* by the pupils—this has long been accepted.)

Pictures must always play an important part in lesson illustration. They are easy to provide in considerable variety and quantity, and they can be readily exhibited and conveniently stored for repeated use. It must be remembered, too, that well-chosen pictures can have genuine æsthetic value. They are often the work of great artists, and study of them should form part of the child's normal experience.

Models, especially those made by children, can scarcely be expected to produce the feelings, such as reverence, awe, and pity, which are experienced in the contemplation of works of art. Neither can we reproduce in a model (except perhaps through an inordinate and impracticable expenditure of labour and skill) the wealth of detail, and particularly the human interest, to be found in many contemporary pictures of life in our own and in other times.

The child when studying pictures has an intellectual and an emotional response. He asks questions, wishes to have the picture explained, wants it endowed with life out of the teacher's greater experience. Then his natural desire is to use the knowledge he has gained to express himself in some form, such as in drama, picture-making, story-writing or model-making.

Making a model may not always be the most apt form of expression. The teacher must make up his mind whether the subject under study has in it sufficient value and scope, and is of such a nature, as to justify the time and effort necessary for model-making. Very often the children's experiences can be adequately expressed in simpler and more rapid form. The temptation to "overdo" model-making is a very real one, which must be resisted.

Types of Illustrative Models. When, however, the subject to be illustrated is of such a nature that the whole cannot be comprehended from a picture, the making of a communal model may well be decided upon. Such subjects as a farm, a village or town; a tract of country showing hills, valleys and other topographical features; a large building or range of buildings such as a castle or monastery, lend themselves especially to illustration by this method. They consist of a large number of features, each of which may be studied from pictures, or better still, from the originals, but which cannot be pictorially represented together in their correct relationship owing to the extent of the ground they cover.

It is true that the "aerial photograph" now increasingly available, and its forerunner, the imaginative "bird's-eye view," can in some measure fulfil the illustrative purpose of this type of model. Even so, they have their disadvantages. For example, although many modern towns and tracts of country have been photographed from the air, often these photographs do not meet exactly the teacher's requirements. They may be too complex, or too scattered, or give inadequate emphasis to the features which it is desired to emphasize. And of town and country in earlier times we have no aerial photographs at all, and but a few bird's-eye views.

The common method of endeavouring to create in the child's mind a clear picture of subjects of this kind is by means of plans or maps, supplemented by pictures of various details. But the plan or map is an abstraction. Many adults do not readily comprehend such things; the device, now common in railway

posters, of covering a map with little pictures is a recognition of the fact that the more a map has the appearance of a model the more widely it is understood. The pictures, which must manifestly be out of proportion, may detract from its accuracy, but they undoubtedly increase its appeal to the uninstructed mind. This is especially true when dealing with young children, and experienced teachers find that models often prove to be the best means of leading their pupils to an understanding of maps.

Several admirable examples of this type of communal model are described and illustrated in this volume.

Models of this kind as a rule consist of a large number of parts or details, and, as will be seen later, each may be the work of one pupil. In themselves these small individual models may have considerable value as illustrations; brought together in the large model their value is increased a hundred-fold.

This may generally be said to be true of most illustrative model-making.

Children may make models of figures with their costumes and arms; of furniture and household goods; of animals wild or domestic, and of a host of other things. In every case, the most value can be gained from the models if they are assembled so as to represent scenes from the life of our own or of another country; of to-day or of past times.

The model of the stage "set" showing a Saxon hall, and of the procession of the Canterbury Pilgrims, are examples of this type. (Plates XVI and XVII.)

Again, it may sometimes be desired to make a series of models showing the development of some feature, such as modes of land transport, shipping, or costume, through the ages. These also are best arranged together, e.g., as a "cavalcade"—something after the style of a time chart, so that progress and gradual change can be traced from one to the other. The set of transport models in Plate XII, and the figures in Plate XX, are suitable for this type of arrangement.

Another kind of model, which may perhaps be more properly described as a piece of teaching apparatus, is exemplified in the contour model illustrated in Plate I. Models of this kind

are made to the teacher's exact instructions, and afford little if any outlet for self-expression by the pupils.

The contour model can hardly be said to bear a very close resemblance to the natural feature which it illustrates, but it is a *diagram* in three dimensions, specifically designed to help the pupils to grasp the notion of contour lines on a map. Although the children who made it may be expected to have grasped its meaning more quickly than others, its primary value is as an aid to the teacher's demonstration and exposition, and as such it has a useful place as a permanent piece of teaching apparatus. A terrestrial globe, with its lines of latitude and longitude, is a familiar "model" of this type.

It is interesting to note that the relief model shown in Plate IV is not in any sense a diagram, because in it every effort has been made to reproduce faithfully the appearance of the actual piece of country which it depicts. Vertical and horizontal distances are represented to the same scale—an unusual but exceptionally valuable feature in a relief map. In this it differs from most relief maps, especially those of smaller scale, in which the vertical distances are much exaggerated, so that the models partake of the nature of diagrams rather than of reproductions in miniature.

In the *making* of the model shown in Plate I much study of contour lines was necessary, and doubtless the contour teaching apparatus was freely used in clarifying the children's ideas.

Still another type of "model" is shown in the empty stage described on pages 102 to 105. Once again we have a model which is teacher-designed; it forms a more or less permanent setting for the various "scenes" which may be made from time to time as communal illustrative models.

MODEL-MAKING AND THE PROJECT-METHOD

So far in this chapter model-making has been considered as having two functions, not mutually exclusive—that of a craft, and that of an illustrative medium.

Model-making as used in the project method of teaching

assumes a far greater importance as an educational factor. In this more comprehensive use its two lesser functions are invariably included.

The ideal of making a model, if it be well-conceived, can so inspire a child, and arouse such vitalizing interest in him, that he will, of his own volition, joyously explore the numerous avenues of information which radiate from it. In the effort to express his ideas (gained from pictures, and verbal descriptions, and whenever possible from first-hand observation) in "the solid," the child has forced upon him, through his desire to make, the necessity of clarifying his mental images, so that they are no longer vague and nebulous. Through this activity he finds out, and incidentally his teacher finds out also, how much he really knows. His interest makes him return again and again to his sources of information, and sends him in pursuit of further knowledge, because he has found out that he does not know as much as he thought he did.

Any one who studies the pictures of the models illustrated in this book cannot but realize the amazing amount of detailed knowledge of history, geography, literature, etc., that the children must have come into contact with, and have absorbed, either through their own exploration or from direct teaching.

The study by children of pictures and other sources of knowledge before and during the making of a model is an essential part of the whole process. It is the teacher's business to supply abundant material for investigation, to suggest lines of exploration, and to criticize and control the informative matter which the children will voluntarily and gladly bring themselves, often in positively embarrassing quantity. Without such tactful guidance and selection by the teacher in discussion with the pupils a valuable opportunity of training in discrimination and in "keeping to the point" will be lost. This does not mean that the child's broadening interests should be quelled, but that he should not be allowed to become loose and casual in his pursuit of knowledge. This is a matter that will demand all the skill and sympathy of the most experienced teacher if he is on the one hand to encourage the "lame dog," and on the

other to utilize effectively the exuberance of the precocious child.

In such ways is the growth of the capacity for sustained independent study to be fostered in the children. This is perhaps one of the greatest values of the project method, and model-making may rightly take its place among the means to this end.

It is obvious that when this type of work is being done there must be considerable discussion and unselfish passing-on of information between the members of a class.

The making of the model should stimulate the inquiring mind of the child, producing questions of "how" and "why." The further acitivities which naturally suggest themselves should be pursued—activities such as planning and scale work in arithmetic, the making of books, records, plays, etc.

The project method, wisely followed with a clear conception of its aims and its limitations, has abundantly demonstrated its value in the modern school. Model-making is one of the most useful of the varied forms of activity which may be chosen as the expression or culmination of a project.

THE ESSENTIALS OF ILLUSTRATIVE MODEL-MAKING

The following points are put forward for the consideration of the teacher who directs the making of an illustrative model:

Preliminary Decisions. If by any other means of illustration or expression the children can equally well, or better, gain what they would from making a model, it is never worth while to make one.

It is not always easy for the teacher to decide on this point—so much depends upon the age and capacity of the pupils. Children of five or six years old may gain much from making a model of even so familiar a scene as their own kitchen at home; on the other hand, intelligent seniors may derive a clearer notion of, say, seventeenth-century London from contemporary pictures, maps and verbal descriptions than ever they would get from a model.

The teacher must ask himself the following questions:

Is there enough "content" in the model—is it capable of being

a centre of interest about which sufficient varied and profitable work can be gathered?

Is the type of model, considering its difficulties of construction, and the amount of research and calculation needed, suitable for the pupils? Will it, on the one hand, be within their powers, both mental and physical, and, on the other, interest and extend them sufficiently?

The Time to be Spent on a Model. Providing that the standard of execution is sufficiently high (see page 14) the quicker a model is completed the better. The children's invariable desire is to see the thing in its finished form. In any event the work should not be so protracted as to outlive either its possibilities as a source of inspiration and interest to the pupils, or its natural connection with the subject under study.

Some models, such as, for instance, the mediæval town shown in Plate VI, are so full of interesting detail that they may well justify the spending of a term or more on their construction, and models of this sort have been found well able to hold the interest of children of nine or ten years old for at least this length of time. But one may well find that too much time can be spent on models of less complexity—of less "content" from the point of view of the studies associated with them—than these. For example, a model of a "desert scene" or of an "Eskimo encampment" convey ideas which are fairly quickly grasped by the children, and which, once grasped, justify no further elaboration. To spend many weeks on making such things, especially with the younger children to whom these models are best suited, is to run the risk of the pupils becoming heartily sick of the sight of them. After they are made, they may be *used* for some time, but this is another matter (see page 15).

Variety in Processes and Materials. The teacher must constantly bear in mind that the primary object of making an illustrative model is to express in concrete form, and so to clarify, the children's ideas. Its aim is not that of giving practice in any particular technical process or with any particular

material. Any process, any material, which seems likely to produce the desired effect in the finished model may be experimented with and pressed into service. Realism of appearance, vividness and vitality are of the essence of illustrative model-making, and no regard need be paid to the "orthodoxy" of the methods adopted to achieve them. For example, if the appearance of a thatched stone building can be well indicated by a simple clay model suitably coloured (see Plate VI), there is no object in introducing the added difficulty of simulating thatch by the use of straw. On the other hand, the less solid appearance of a thatched wooden building may be best shown by using corrugated paper, twigs and raffia, as can be seen in the Frontispiece.

In general, the easiest expedient for producing a realistic effect is the best to use. Indeed, the children themselves, unhampered by any conventional notions of technique, will often suggest materials of the simplest description which will prove to be the most successful in use.

Quality of the Finished Model. Although, in the foregoing paragraphs, systematic craft training has been shown to be out of place in the making of illustrative models in school, and although improvization and the adoption of any expedient which will meet the case is advised, this must not be taken to mean that anything but the most honest and painstaking effort should be accepted from the children. It is difficult to believe that there can be any true clarification of ideas, or real educational gain, from muddled or slipshod work.

How is the Standard to be Decided? It can be said definitely that there is no absolute standard of accuracy and finish to be expected of all children of a given age.

The factors that influence the standard reached in the making of a model fall naturally into two groups. First, there are such matters as the importance which this activity is allowed to assume in the time-table; the size and the composition of the class; and the space, furnishing and equipment available. These generally lie outside the control of the class teacher, but when

they are such as to cause difficulty, the handicaps can, and often are, overcome to a surprising extent by enthusiasm and enterprise.

Second, there are those matters which are in the hands of the class teacher, including the various details of teaching method, the extent to which the children's interest is aroused and maintained, and, in fact, all those things which constitute effective guidance.

Some suggestions as to teaching methods, and a discussion of some of the causes of a low standard of work in model-making, will be found later in this chapter.

The experience of the past few years, when much attention has been paid to handwork in schools, has made it almost a commonplace to say that children often surprise their teachers by the standard they reach. The teacher's wisest course in directing illustrative model-making is to aim at the standard reached by the most successful teachers, and the special value of a book of this kind lies in the illustrations of models produced in one school, by many classes of normal size working in ordinary classrooms with their own teachers, and in the course of their normal school work.[1]

How well the models have been made can be perceived from the photographs; how these results have been achieved is indicated in the text and the diagrams.

The Need for "Living Interest" in Models. Since most models will represent scenes of every-day activity, as much indication as possible of this activity—of the "life" of the scenes depicted, should be included in them. It is generally true to say that the more a model can be made to include its "inhabitants," be they animals or men, trains or ships, the more it will appeal to the child and the more it will fulfil its illustrative purpose.

[1] Of the 17 models or groups of models illustrated in this book, 2 are from Senior Boys' and Senior Girls' schools respectively. The remaining 15 are from a large Junior and Infant school, and represent the work of 1 infant class (1 model) and of 8 junior classes, of various grades of intelligence, each of about 50 pupils working under ordinary classroom conditions. All the models except the teaching model shown in Plates 1 and 2, were made as part of the project work of each class, and were completed well within the six months devoted to each project.

A model farm without the farmer and his men, horses, cattle, sheep, pigs and fowls is likely to be little more interesting than a model "Zoo" with empty enclosures and cages. A model railway-track, however intricate, is but a dead thing without its trains; a model of the docks is nothing without its shipping.

Models of buildings can often be improved by the addition of figures and animals (see Plates IX and XI), and models of towns can show the traffic in the streets.[1] Even where the scale is such that these "living" details would be too small for inclusion, as in the topographical model shown in Plate IV, indications of human habitation can be put in. It is seldom that a model will be made in school of a subject which in the original is entirely static and lifeless.

Such indications of "life" in a model may be crude and meagre compared with the "real thing," but it should be remembered that, however simple the model, the young maker will read into it much more than it actually contains if his interest has been aroused and his knowledge enriched by that study of pictures and verbal descriptions which is held to be an essential part of illustrative model-making.

Models and Play. If when a model has been completed the makers can "play" with it by rearranging the figures, animals, road, rail or sea traffic, etc., that may constitute its "living" or active features, they will gain far more from it than if these details are fixed into place. Learning through play is one of the features of the project method. No one can estimate the extent to which different children, when playing with a model which they have made, endow it with life and activity from their imaginations, which have been fed by skilful teaching.

The possibilities of arranging various historical scenes in certain models will readily suggest themselves to the teacher.[2]

[1] Many teachers have found that the small leaden models of people, animals, carts, etc., which can be bought in the cheap multiple stores in such variety, are of great use in "peopling" children's models. If these are to be included it is important that the model is planned to a scale suitable to receive them.

[2] E.g., the model of a Norman Castle shown in Plate IX is set with figures showing the tenants bringing their dues to their feudal lord, i.e., it is a "story" as well as a model.

The desire to play with models in this way is generally more natural to younger children, but there is no doubt that to some extent it persists in later life. We have all met adults who find pleasure in manipulating a model railway.

SOME ERRORS TO BE AVOIDED IN MODEL-MAKING

Keeping Models too Long. The value of illustrative models is primarily for the children who have made them, and when the particular course of study with which the models are connected is completed, they should be ruthlessly dismantled, however attractive they may be. This will be one of the teacher's hardest tasks, for the temptation to preserve attractive models is very great. How often one sees last term's or last year's model, or even that of two or three years back, occupying much-needed space in the classroom, steadily disintegrating and becoming more of a dusty relic. The only satisfactory way to preserve a model for any length of time is in a glass case, and the place for such permanent models is the museum, where children may visit to see but not to handle them. Few schools have space which can justly be given to the accumulation of models, and where they are kept it almost invariably means that further model-making is hampered or prevented by lack of room.

No teacher has the right to deprive his pupils of the joy of creative effort simply because children previously in the class have experienced that joy in making a good model. The very fact that their predecessors found pleasure in the work, and did it well, is a strong reason for "scrapping" the model and for leaving the field clear for the next generation of pupils to have the same opportunities.

The Use of Perspective Views. Models that require highly-developed perspective views—extreme foreshortening, etc., such as is not uncommon in stage settings—are generally unsuitable because the planning of such views is beyond the powers of the pupils. If, as is sometimes the practice, these difficult pictures are provided ready-made either by publisher

or teacher, the children's part in them is limited to the mechanical cutting-out of the outline shapes—shapes which, however well they may appear when assembled in the finished model, are often, when seen by themselves, grotesquely distorted versions of the real thing.

This cutting-out and assembling may be better than no activity at all; it certainly does not by any means exploit to the full the possibilities of model-making as a form of the pupils' expression.

As a rule the most valuable models to be made by children are those which are truly three-dimensional—which can be viewed equally well from all sides. "Scenes" or "dioramas" to be looked at from one viewpoint only may be most appropriate in their place as museum exhibits—kept behind glass—but they are rarely suitable for emulation by pupils in school, except possibly as pieces of advanced craftwork to be done by senior pupils who may be specially interested.

There is no reason, however, why the teacher should not sometimes use his artistic skill to provide a "back-cloth" for a model, to inspire, delight and encourage the children. (See Frontispiece and Plate III.)

"*Inversion*" *of Illustrative Value.* This error applies especially to teaching devices rather than to realistic models, and consists of making the lesson fit the illustration (because the latter is facile and ingenious) rather than relating the illustration to the real needs of the lesson. It is especially to be seen in the teaching of practical arithmetic and mathematics. The ease with which models can be made to illustrate such expressions as $a^2 - b^2 = (a + b)(a - b)$, or the formula for the area of a circle, may lead to these things being dealt with out of their due place in the course. This appears to arise from a misguided notion that what can be readily illustrated in the concrete is necessarily "practical" and hence useful.

SOME CAUSES OF WORK OF A LOW STANDARD IN MODEL-MAKING

It can usually be taken for granted that there are three

main reasons why a child may do model-making of a standard below that of which he is capable.

(*a*) There may be bad guidance by the teacher, frequently in accepting too low a standard, occasionally in demanding too high a standard, from the child. The extent of the teacher's own technical knowledge and skill, his ingenuity, and his capacity for suggesting ways of doing things for the children to follow successfully, are most important factors in obtaining a high standard of work.

(*b*) There may be lack of interest on the part of the pupil, because the model is ill-chosen, being unattractive, so easy as to be beneath what the pupil considers worth while, or so difficult that he is speedily discouraged. The preliminary stages may be too-long-drawn-out; or the teacher may not be ready enough in his suggestions as to how difficulties may be surmounted. It is worth considering whether the teacher, when working with children of low intelligence, should not by the most careful forethought and guidance so arrange matters that a reasonable measure of success *must* follow their efforts. This end should not be achieved merely by giving them easy tasks, but by so directing them that they will not fall so far into error as to become disheartened.

The persistent recurrence of failure confirms a child in backwardness. The first move in getting him to realize that he is a worthy member of the school community is the restoration of his self-respect; in this no factor is more potent than success in creative work which has called forth all his powers.

(*c*) There may be lack of self-control on the part of the child, resulting in impatience and careless work. This is especially common among children of a volatile temperament, who are so anxious to get forward with the model that they hurry on uncritical of the quality of their work.

On such occasions definite training is necessary. The child should have the opportunity of comparing his work with that of his class-mates—of asking himself "Has this

earned a place on the class model?" Few children will fail to give an honest verdict on their own work if the matter is put to them in this way.

TEACHING METHOD AND CLASS MANAGEMENT IN MODEL-MAKING

Making a Start. The approach to the making of a model, and the method of working to be adopted—i.e., whether the work on the model is to be continuous until it is complete, or is to be interrupted by periods of teaching following each stage—will naturally vary, but it is certain that as soon as the words "Let us make . . ." are used by the children an immediate start should be made.

The crucial time in model-making is most often the start. The impetus of the first fervour to "make something" is invaluable, and may be lost if too much time is spent in "niggling" over preliminaries and details of base, plan, scale, etc. There must be discussions concerning these matters; pictures and books containing information should be studied, and a general plan of campaign decided upon, but the skilful teacher will lose no time in setting all his pupils on to organized and interesting work, even if at first he has to make many decisions and to give material assistance in "getting things going." Later on less initiation should be required of the teacher; more and more his task will be that of adviser as, the work once organized, the children take its development more and more into their own hands. As the work proceeds, further details will be suggested by the children and by the teacher. This will involve more discussion, research and study, until a concrete picture has been built up which will provide an inspiration for many lessons.

Organizing the Class. As groups, the children will undertake the preparation of the base (as far as this may be within their powers), such tasks as the making of papier mâché, etc., and the making of those features which need to be quickly done to provide a suitable setting for the more detailed parts of the model. Often this group work may be extended into the making

of the smaller details of the model, each group being responsible for the completion of a definite section.

Many models may be regarded as collections of units such as buildings, figures or animals, or a combination of these, in a suitable setting. Where the making of one of these units is considered to be a valuable educational experience, every child in the class should make one. The best of these individual efforts are then chosen to take their places on the communal model.

As the model progresses it should so stimulate the children's interest that many of them will freely make individual efforts to contribute further interesting details of their own devising. Perhaps the most interesting example of this free individual work is seen in the extent to which pupils, once their interest has been aroused, have brought to school the results of work done at home, where they have experimented in the use of various and sometimes novel materials in order to contribute something "of their very own" to the model.

The Backward and the "Difficult" Child. The teacher must continually guard against the possibility of any child being excluded from having his work represented in a communal model because he is less capable than his fellows. Although some may not have the skill and aptitude to produce individual models or details of such high standard as to warrant their inclusion in the communal effort, there are few models which will not provide some tasks which can be done successfully by the less skilful children, and which they will delight in doing.

Preparing the papier mâché for modelling, painting the base and other large parts, and a host of other "jobs" will suggest themselves, so that no child need feel that he has not made some contribution to the model, even if his own piece of detail modelling is not selected for inclusion. If a child is so individual, or even anti-social, in his attitude that he does not wish to enter into the communal effort, it is well to give him the opportunity of working entirely on his own account, waiting to see if his observation of the interest and pleasure aroused by communal work will not eventually draw him into its circle.

PART ONE

THE TECHNIQUE OF MODEL-MAKING

No special references to tools for model-making have been made in this book, for few processes are described which cannot be carried out with the simplest equipment such as may be found in every school. It may be necessary to obtain one or two woodworking tools for making the bases. The types of bases here described are all so simple in construction that they may be confidently attempted by anyone whose knowledge of woodwork is of the most modest description.

CHAPTER ONE

MATERIALS FOR MODEL-MAKING

IT will be found that a considerable amount of material and equipment used in making models is already in school. The introduction of the teaching of the traditional crafts, the greater interest in "woodwork," not only for the senior boys but for the older section of boys in the junior school and in some cases even for the girls, and the "New Art" teaching have brought a wealth of new material and tools which can be pressed into service.

The simplest materials, provided that the resultant effect gives satisfaction to the child, can frequently be used. These are often the "waste" materials of any home or of shops and it is a wise plan to make a collection of them so that they are in readiness if needed.

SUITABLE "WASTE" MATERIALS

Boxes are invaluable; wooden, cardboard, tin, small round pill boxes, etc., can all be utilized and it will be found particularly useful if a number of the same size, shape and material can be kept in store.

Corrugated paper will come in, if asked for, in quantities, both single and that covered with paper on both sides. Shavings, sawdust, strawberry-baskets, cotton-reels and old pieces of loofah have all been used. Uses for many other oddments will occur to the ingenious teacher.

A friendly timber-yard may provide a quantity of odd pieces of sawn wood.

OTHER MATERIALS

Cardboard. Most schools will already have a selection of

strawboard and other cardboard. The white variety of cardboard can be used for many things, particularly for the making of buildings with the measurements marked in pencil, as the children can easily see the markings. This card will readily take colouring for finishing purposes.

White cardboard can be obtained in several thicknesses. The thinnest, known as "3-sheet," should be used if the children have only scissors for a cutting-tool. It will not crease well, however, unless the blunt end of the scissors is first run along the inside of each bend. It can be obtained in sheets of "Royal" size, 25" × 20", and also in packets cut to certain sizes, ranging from 6" × 6" to 9" × 9". These cut pieces save the teacher the trouble of having to cut up large sheets.

The medium, "6-sheet," and thick, "10-sheet," can be cut by older children, but the latter only if they are able to use a knife and straight-edge ruler. All bends must be made with a half-cut, a delicate process that requires good control of the knife and ruler.

Strawboard. This is cheaper than white card, but has disadvantages, in that it does not show the markings clearly for the young child to follow, and also does not take colour readily.

It can be bought in sheets 30" × 25", and the thickness is indicated by specifying the weight of the sheet. The sheets weighing 10 oz. or 12 oz. can be cut easily with scissors; those weighing 16 oz. are more difficult to cut, particularly if the sheet is more than a few inches wide. All strawboard of greater thickness must be cut with shears, and trimmed with a knife, unless a card-cutter is available.

Plasticine. This has been in use in schools for many years. It can now be obtained in a large variety of colours, but owing to its oily nature it will not take a paint direct with any success, unless it is an oil-paint. A coating of size will, however, overcome this difficulty (see page 101).

Clay. The interest in pottery in schools has made this material familiar in many departments. Infants have long employed it as a modelling medium, but it has several disadvantages in use. It is, however, much cheaper than plasticine, and should be

used if a large quantity of plastic modelling material is needed. The "prepared" type, which can now be obtained, does not need baking and sets quite hard on exposure to the air. It must be kept in a moist but not too wet condition to be successful in use, and should therefore be kept in a galvanized bin in the bottom of which a few bricks should stand in an inch or two of water. If the clay rests on the bricks, through which the moisture percolates, and a damp cloth is placed over the top, it will keep in good condition with little attention.

If a large quantity of clay is used in a model, there must be good support in the base, as the clay is very heavy. Also there is considerable shrinkage in drying, which shows distinctly if a large block is used in the making of a model.

Wood: Plywood. This has many uses, particularly for the older boys who can handle the necessary tools. It is sold in several qualities and many thicknesses. The most suitable type for model-making is either 3-millimetre or 4-millimetre birch plywood, "sanded," i.e., smoothed, on one or both sides. For very large bases, however, 5-millimetre or 6-millimetre plywood will be better. Sometimes quite serviceable pieces of plywood, suitable for small models but not large enough for bases, may be obtained from tea-chests.

It is always best to buy whole sheets of plywood if there is space available for storage. The most convenient sheets to buy are 60" × 48" and 60" × 60".

Thin alder plywood in thicknesses of 0·8 mm. and 1·5 mm. can be obtained. This can be cut easily with scissors, and can be bent to a sharp curve, but it is expensive if used to any great extent.

Wood: Deal Strips. Deal strips, either sawn or ready planed, are needed for the construction of bases, and can quickly be cut across to give a supply of small blocks when needed. These strips can be obtained in sawn sizes of 2" × 1", 2" × ¾", 2" × 2", 1½" × 1½", and 1" × 1". When planed these sizes are reduced by approximately ¼".

Cheap qualities of wood are seldom worth while, as such timber is often twisted, warped and knotty to such an extent as to make good work impossible.

Wood: Stripwood. This is usually a fine-sawn wood of even grain—either satin walnut or hazel pine. It is smooth and generally true to size, and is sold in 3-foot lengths. It can be obtained from educational handicraft firms, or those specializing in supplying materials for hobbies. There is a wide range of sizes, but the following selection will be found most useful: $\frac{1}{2}'' \times \frac{1}{8}''$, $\frac{1}{4}'' \times \frac{1}{4}''$, $1'' \times \frac{1}{8}''$, $\frac{1}{8}'' \times \frac{1}{4}''$, $1'' \times \frac{1}{4}''$, $2'' \times \frac{1}{4}''$.

Triangular stripwood can be obtained in the following sizes: $\frac{1}{8}'' \times \frac{1}{8}''$ right-angled triangle, $\frac{1}{4}'' \times \frac{1}{4}''$ right-angled triangle, $1'' \times 1''$ right-angled triangle.

Wood: Printing Sticks. If wooden blocks are needed, and tools are not available, the small wooden sticks known as "printing sticks" supplied for printing designs in connection with book-crafts, can be used. They can be obtained in many sizes as for stripwood, but all are short lengths, usually about 3". The triangular blocks are only $\frac{3}{8}''$ or $\frac{1}{2}''$. These are considerably more expensive than stripwood if used in large quantities.

Wood: Match-sticks and Kindergarten Sticks. Match-sticks have many uses in model-making. The longer sticks of similar thickness, so often used in the kindergarten, are still more valuable.

Wood: Dowels. Birch or beech dowels, i.e., round rods, can be bought in various sizes from $\frac{1}{4}''$ to $\frac{7}{8}''$ in diameter in 3-foot lengths. Old broomsticks can be used if round sticks of greater diameter are needed.

Adhesives. Cold-water paste, made by adding one of the proprietary brands of powder on the market to cold water, will be found to be the best and cheapest for assembling cardboard or paper shapes in large quantities.

Ordinary glue, i.e., hot glue, can be used when working with wood or strong card if a glue-pot is available, but a prepared "liquid" glue, such as "Croid," which, when slightly warmed, remains liquid for a considerable time, is much more effective and convenient. For work requiring only a small quantity, liquid glue in tubes is excellent, as it is convenient and sets quickly.

Colouring Materials. When a class is working in paper or cardboard, water-colour can be utilized, but powder or tempera colour, now frequently used in art lessons, is much more satisfactory.

Powder colour can be obtained from any oil and colour merchant, but requires the addition of size before use. The prepared tempera colours, sold by firms dealing with art supplies for schools, are more convenient. They can be used on practically any surface, including wood. Usually one coat only is required and it is quickly applied. It is inclined to rub off if handled, hence it is not suitable for painting teaching models, such as the contour model described on page 73, which will be constantly used.

Poster colours can be employed in the same way, but are more expensive.

For more permanent work on wood, quick-drying enamel paint is effective, and gives a hard, smooth finish. It is best to give cardboard or wood a coat of size before using this paint.

Cut-shapes in paper can often be used to indicate windows, doors, etc., with good effect. Brightly coloured paper with an adhesive back is best for the purpose.

Size. This is sold in the form of powder, and can be bought at any decorator's shop. It is ready for use after it has been dissolved in boiling water. A preliminary application on any absorbent surface will save much paint or enamel later.

Cellophane and Celluloid. Cellophane can be bought coloured or plain very cheaply. A thick cellophane, which is waterproof, makes a good substitute for glass in models. It is made in large sheets, 30" × 20", and can also be bought in smaller pieces.

Thin sheet celluloid is still better as a glass substitute, as it is stronger and can more easily be fixed in position than cellophane. It is 0·01" thick, and can be bought in sizes from 12" × 12" to 54" × 24".

Doll's Hair. Crepe hair, obtained from any theatrical supplier's, is admirable for making hair for small dolls and figures. It can be bought in a variety of colours, and is inexpensive.

CHAPTER TWO

BASES FOR LARGE MODELS

ONE of the teacher's first tasks will be to find or to make a base for the model which is to be constructed.

First of all a survey of the available schoolroom furniture should be made, to see if a ready-made base of suitable size can be found.

Many schools can provide one of the following: (*a*) a table, (*b*) a trestle or folding-table, (*c*) an old blackboard, (*d*) an old disused desk, (*e*) a sand-tray.

If a table is to be used, the model should not be built directly upon it. A layer of strawboard may be placed on the table, and the model built up on that. This is not particularly satisfactory, as the painting of the groundwork may buckle the strawboard. A piece of plywood placed on the table is better, but if this is very big it may buckle badly when anything wet is put upon it.

Blackboards may be used in the same way as a table-top, or the model may be built directly upon an old blackboard as a base.

Old desks can easily be converted into tables by fixing a piece of plywood on top from back to front, using blocks of wood screwed to the front or lower edge of the desk to level up the top.

For small models, thick plywood, without any under-framing, has been found very satisfactory for bases. It may be bought from any timber-yard ready cut to the sizes needed.

If, however, tools and wood are available the base for a large model is far better made on a frame, as it can then be placed on a table, on desks or boxes or on any convenient support, and can be easily moved when necessary.

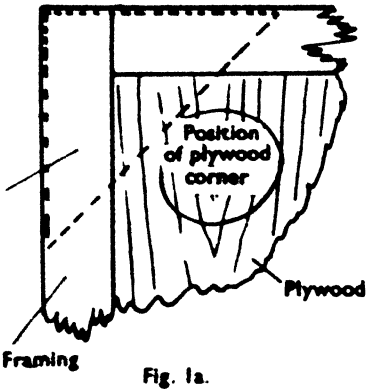


Fig. 1a.

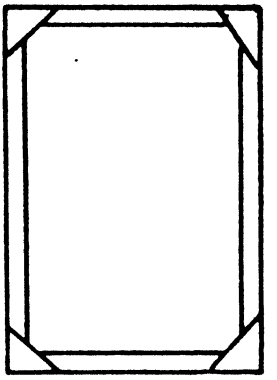


Fig. 1b.

Underside of base

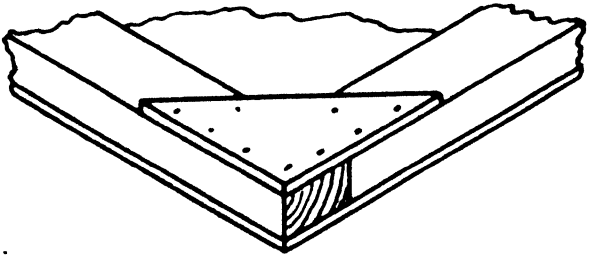


Fig. 1c.

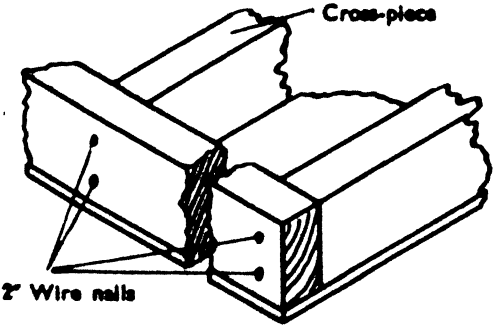


Fig. 1d.

CONSTRUCTION OF A LARGE BASE ON A FRAME

Method 1. *Frame laid flat.* Cut a piece of plywood to the size required for the base.

Cut two pieces of deal strip (2″ × 1″) to the same length as the base, and nail the plywood at its two long edges to these strips, using panel pins or fine nails every three inches.

Cut two more pieces of deal strip, long enough to fit across the ends of the base, and to go exactly between the ends of the first two strips. Nail the end of the base to these.

Cut four right-angled triangles of plywood, with sides of about 6″. Nail one of these firmly across each corner of the framework. (Figs. 1a, 1b and 1c.) These triangular strengthening pieces may be used on any existing base which is not sufficiently rigid—the thicker the plywood the stronger will be the result.

Method 2. *Frame placed edgewise.* Proceed as in Method 1, but nail down the plywood to the first two strips placed edgewise instead of laid flat.

Cut two more strips to fit between the ends of the first two—these second strips must fit accurately, or the corners will not be strong. When these two strips have been nailed down, two 2″ nails should be driven through each corner of the frame. If the corners still seem to be weak strengthen them with triangular pieces as in Method 1 (Fig. 1c).

This type of base, if well made, is very strong and rigid and will carry a heavy model. If the base is very large, or the model is to be especially heavy, cross-pieces should be used to prevent sagging, which may occur with thin plywood (Fig. 1d).

Method 3. *Flat frame with halving joints.* This method requires more skill in woodwork than those last described, but if it can be used it produces substantial bases which are very rigid, and which can be used again and again for an indefinite time.

Cut the plywood to the size required for the base, and cut also four pieces of 2″ × 1″ deal to form a frame of the same size as the plywood, i.e., two pieces will be needed the full

length of the base, and two pieces the full width. The best result is obtained if these strips are planed—if bought ready-planed the strips will measure approximately $1\frac{7}{8}" \times \frac{7}{8}"$.

The ends of the strips must be prepared for a halving joint, as shown in Fig. 2a.

Fit the four strips together with $\frac{1}{2}"$ screws to form a frame (Fig. 2b). The joints will be stronger if they are also glued. Nail the plywood to this frame with fine nails or panel-pins.

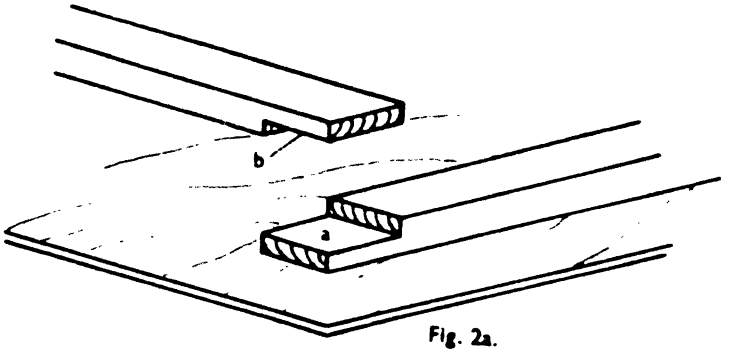


Fig. 2a.

The two surfaces a and b should be glued.

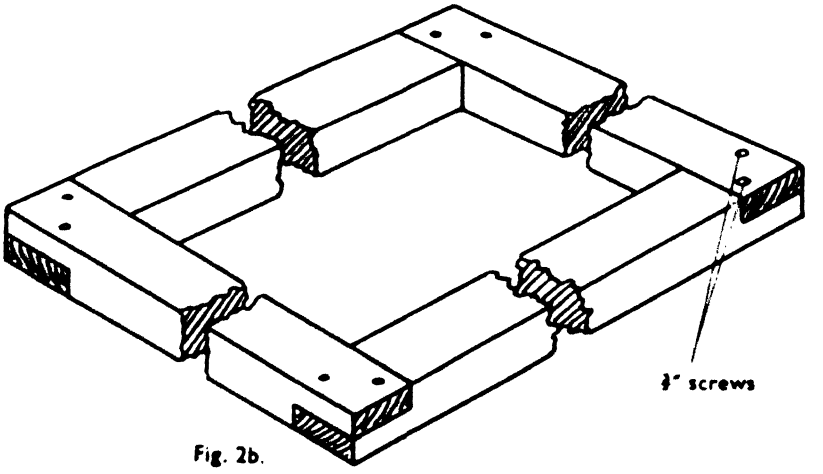


Fig. 2b.

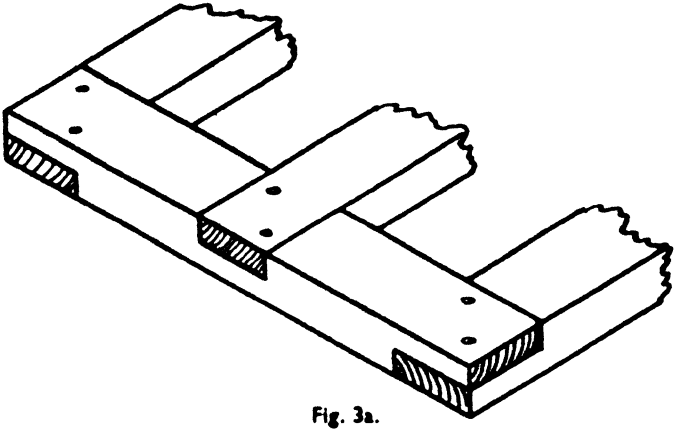


Fig. 3a.

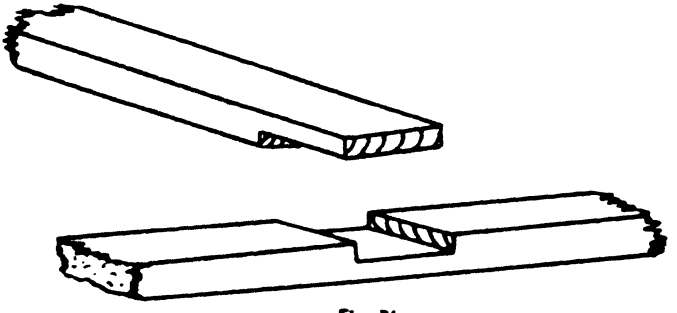


Fig. 3b.

Joint for cross piece of frame

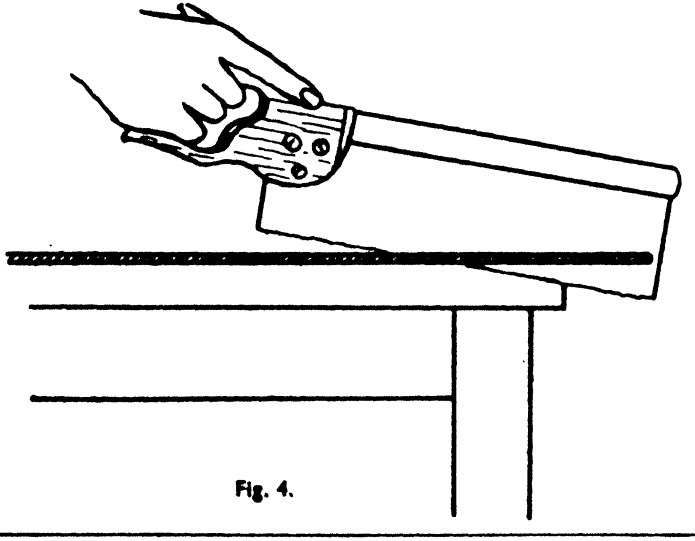


Fig. 4.

Bases with Raised Edges. If a base with a raised edge is required, any one of the methods described can be used, and the base simply inverted with the frame uppermost.

A large base to carry much weight can be made much stronger by using one or more cross pieces jointed into the frame, as shown in Figs. 3a and 3b.

Points to observe when cutting plywood.

1. Use a *sharp* tenon saw.
2. Support the plywood close to the cutting line.
3. Do not saw too quickly.
4. Keep the wrist down when sawing so that the saw does not meet the wood at too sharp an angle (Fig. 4).

CHAPTER THREE

PLANNING THE MODEL

THERE must be considerable discussion with the children before starting to make any type of model, either one that involves the making of a large number of articles and assembling them on a base, or one which involves only one structure.

The pupils should, whenever possible, study pictures of the whole subject, and of its various parts, and then the size of the model should be determined. On the whole, the largest possible size is generally best, and this will very often be determined by the space available, which, unfortunately, in our crowded classrooms, does not always give much scope.

The children should then make a rough ground-plan indicating the positions of the chief parts, if it is a model which lends itself to this method, and the plan should be roughly drawn on to the base which has been already prepared. The size of the whole being fixed, unless it is to be an accurate scale-model it is wise to arrange the size of one of the most important features of the model. If figures are to be used, the general scale can be fixed by these. If not, some building can be chosen which will give a standard from which to work. If a model is being made to scale, this problem is naturally solved by the actual size allowed for the base.

Building up of Ground Relief. Should it be planned to build on a flat surface, a start can quickly be made after the above-mentioned preliminary discussion, but landscape models, etc., can be made considerably more interesting if the groundwork is not level. Indeed, in some cases, inequalities of ground level form an essential part of the undertaking.

A good method of building up various levels of ground is by using papier mâché. This is made as follows:

A fairly large quantity of newspaper is torn into small pieces

—the smaller the better. These are covered with water and left to soak. Every day for at least a week this paper is well squeezed, and a fresh supply of water added. When the paper is forming a pulp, whitening and dry powdered size are added, and the whole well mixed, until the pulp is formed which can readily be moulded. It is then ready for use.

If the papier mâché is needed more quickly, it is possible to make the pulp by squeezing it and changing the water far more frequently.

When applied, papier mâché can be smoothed easily by brushing it over with paste or hot size. It is especially important to do this near the edges if they are very thin, so that they can be made to adhere closely to the base. It is easiest to cover the whole surface to be raised with a fairly thin layer, and then gradually to build by adding succeeding layers, until the shape approaches that needed.

The final shape is moulded with the fingers, adding more pulp where necessary.

Building up Mounds. It is hardly wise to use papier-mâché to build up a height of more than four or five inches, owing to the weight of the large quantity needed, and the moisture which tends to warp the base. Should a mound be needed to rise sharply above the surrounding area, as in Plates V and IX, it can be made in various ways.

Method 1. This method results in a light-weight mound, as the mound is hollow. The approximate height needed should be decided, and modelling clay heaped to the required size and shape to make a mould. Paper, preferably absorbent, such as newspaper, sugar paper, or any other with an unglazed surface, is then roughly torn into pieces about 3" square. The clay mould is first completely covered with a single layer of these pieces of paper. They should be pasted where the edges overlap, but great care must be taken that no paste touches the mould (Fig. 1).

When the first layer is complete, a second layer is well pasted on. If a paper of different type or colour is used it will be easy to see that the first layer is completely covered. About four or

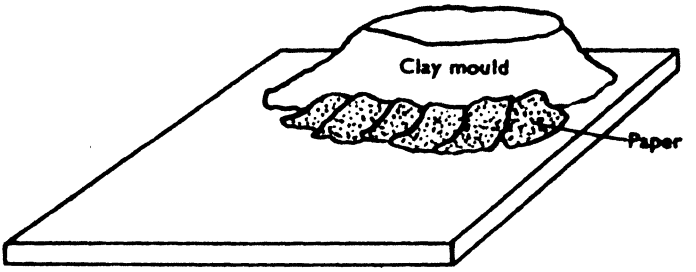


Fig. 1.

Building up a papier maché mound.

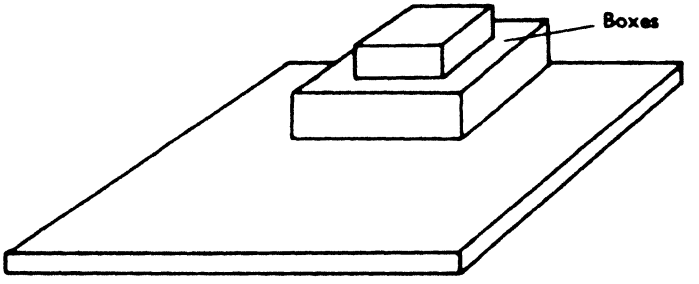


Fig. 2.

Base for large mound.

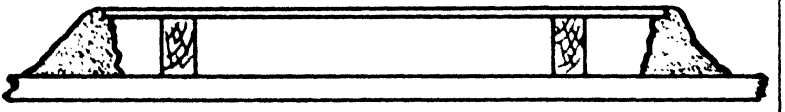


Fig. 3.

Section of Flat-topped mound.

five successive layers of this sort will be needed if the mound is large.

The whole is then left for a few days to dry. When the surface seems hard it is possible to prise up the edges of the thick paper covering, and the whole shape can be lifted from the clay foundation, which is then discarded. The pasted paper will have formed a solid cardboard shape which is very light, but strong, and which can easily be attached to the base of the model.

Method 2. Wooden boxes form the foundation in this method. Two or three boxes of graduated size are placed one above the other, and nailed or screwed together and to the base (Fig. 2). These will then form an approximate shape for the basis of a hill with sharply rising sides. If a smooth surface is required, the whole can be quickly covered with papier mâché. If a rough surface is wanted, "rocks" can be made. Details of these are given on page 60.

Method 3. This method, which results in a flat-topped mound, requires the use of plywood, deal strips and papier mâché. A piece of plywood is cut with a fretsaw to the shape of the top of the mound. Thick pieces of wood are needed as supports; the thickness of these depends on the height of the mound. The plywood is nailed to these. The supports are then glued to the base, and the surrounding slopes built up of papier mâché or "rocks" to the level of the plywood top (Fig. 3).

CHAPTER FOUR

METHODS OF CONSTRUCTION: (1) BUILDINGS

ONE of the most important tasks in the making of illustrative models is that of representing buildings. Miniature buildings can vary from the simplest type made by the youngest children from "waste" materials to the advanced scale model. Various materials can be used, the choice being influenced by the size of the model, the age and ability of the children, and by what materials are ready to hand. Several types of construction are described here in detail; some may be familiar to many teachers, most can be adapted to give many variations.

CONSTRUCTION WITH BOXES

If boxes are used as a base or foundation, substantial models can be quickly produced, ranging in size from very small ones made with one or two match-boxes to large ones in which orange boxes nailed together are used. A very simple and easily-made house can be constructed from two boxes of equal size. One box makes the body of the house. The other is cut diagonally (Fig. 1a), and one-half is used for the roof (Fig. 1b).

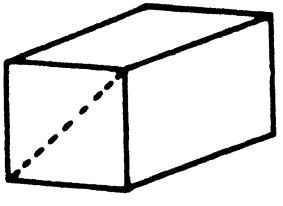


Fig. 1a.

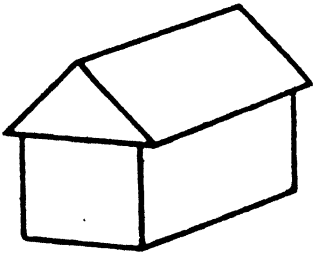


Fig. 1b.

CONSTRUCTION BY PAPER FOLDING

This method is very simple and is especially suitable for younger children. The buildings should be of moderate size and be made of a fairly substantial and stiff paper. Fig. 2e shows a finished building of this kind.

To make, fold a square piece of paper into sixteen squares (Fig. 2a). Cut along AB, and trim a strip about ¼" wide from each end of the remainder. The shaded parts are waste.

Fold along the centre, CD (Fig. 2b), and cut along the continuous lines. The broken lines represent the folds.

Fold flap X over flap Y and paste. Repeat for other end (Fig. 2c).

Fold flap 1 over flap 2 and paste. Repeat for other end (Fig. 2d).

This building can be made from simple measurements, instead of by folding a square, if required, and can be finished off in a variety of ways (see Chapter VI).

CONSTRUCTION IN CARDBOARD OR PAPER, USING MEASUREMENT

(*a*) *Simple Building in Two Sections.* A simple model of a house can be made in two separate sections by young children who are able to use the ruler for easy measurements. The method produces a building similar to that constructed with boxes, as described on page 37.

First make the shape for the oblong block for the body of the building (Fig. 3a). For young children the flaps for joining should be at least ½" wide. Score or crease along the dotted lines. Fold and paste together to form an oblong box.

Draw the shape for the roof on a square piece of paper or cardboard (Fig. 3b). Cut away the four corners, and crease or score along the dotted lines. Fold A over B, and C over D, and paste these flaps together. Trim off the projecting corners of the ends, and then form the base of the roof by pasting 1 over 2. Attach the roof to the body of the house by pasting the top of the body to the base of the roof (Fig. 3c).

(*b*) ***Building with Gable Ends, made in one piece.*** This type is

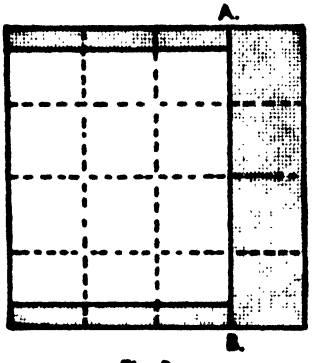


Fig. 2a.

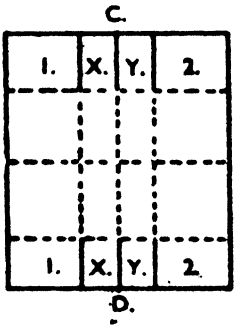


Fig 2b.

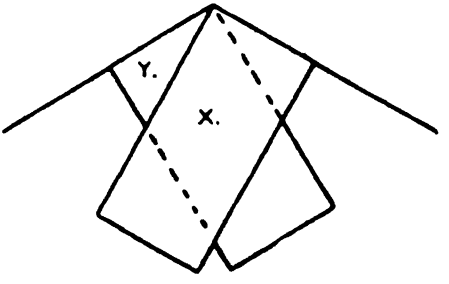


Fig 2c.

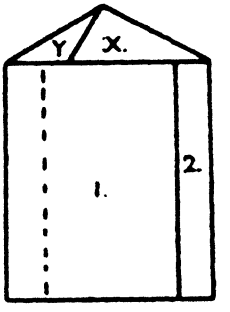


Fig 2d.

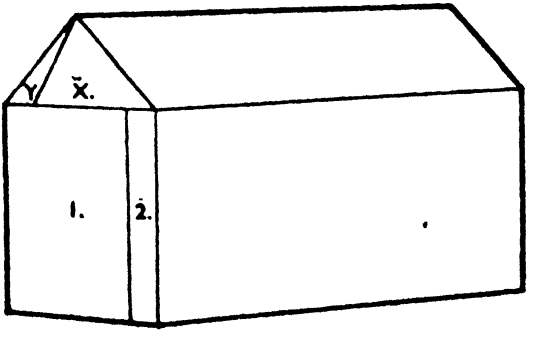


Fig 2e.

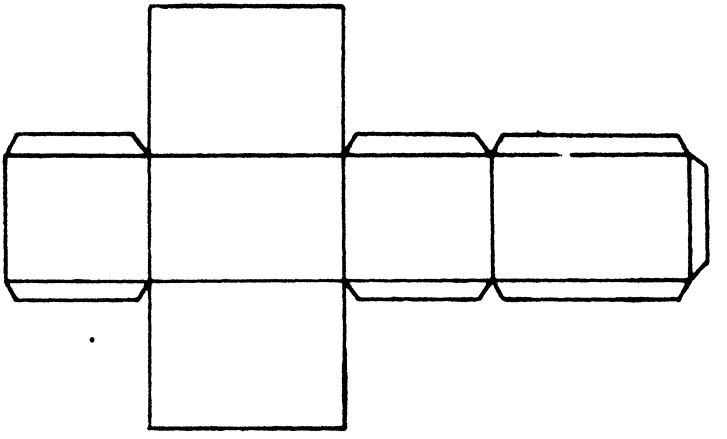


Fig. 3a.

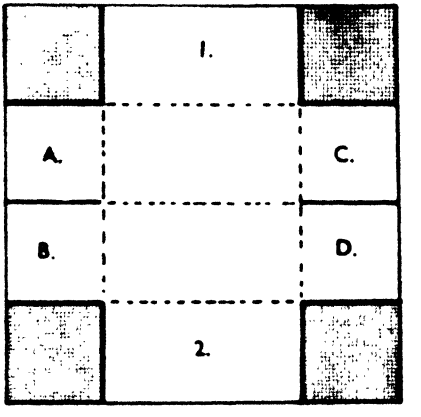


Fig. 3b.

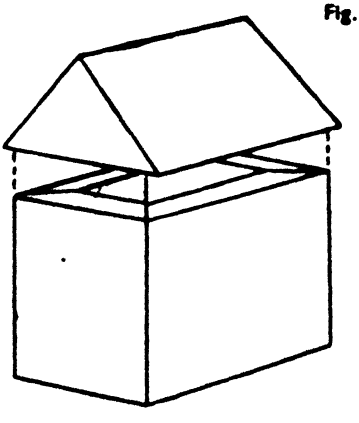


Fig 3c.

suitable for all kinds of buildings. It can be adapted to any size, and many additions can be made to it.

Draw the shape for the whole building, calculating the breadth of the rectangles forming the roof from the sloping sides of the gable (Fig. 4a). Cut this out, fold, and join together, leaving the base until the last. If desired add a further piece of paper or cardboard to the roof so that overhanging eaves are formed (Fig. 4b).

(*c*) *Building with Hipped Roof* (Fig 5c). Draw the shape for the four walls (Fig. 5a). Cut this out, fold, and join the walls together. If preferred, a box of suitable size and shape can be used for this part of the house.

Draw the shape for the hipped roof (Fig. 5b), making it slightly longer and wider than the walls so that the roof will overhang to form eaves. It is not advisable, unless a very steeply-pitched roof is required, to make the triangles for the hips taller than the house is wide.

Cut this shape into four separate pieces. Form the ridge of the roof first, by pasting the ridge-flap and joining the sides of the roof together. Then place the ends or hips in position pasting them down to the flaps. Attach the roof to the top of the walls by the flaps. Finally paste a base to the bottom of the house, using the lower flaps on the walls.

CONSTRUCTION WITH CLAY

Small buildings of any type can be made very quickly and easily with clay, which is a very successful medium, giving a satisfying appearance of solidarity. The method is particularly suitable for the younger children. When these clay models are dry they take a wash of powder colour extremely well. On the whole, buildings larger than a few inches in width and length will be less successful than smaller ones, as the clay in such bulk will shrink when drying, sometimes unevenly.

In smaller models this shrinkage produces slight irregularities which are very attractive and effective in representing ancient buildings. The model of a mediæval town, described on page 86, is a good example of the use of this method.

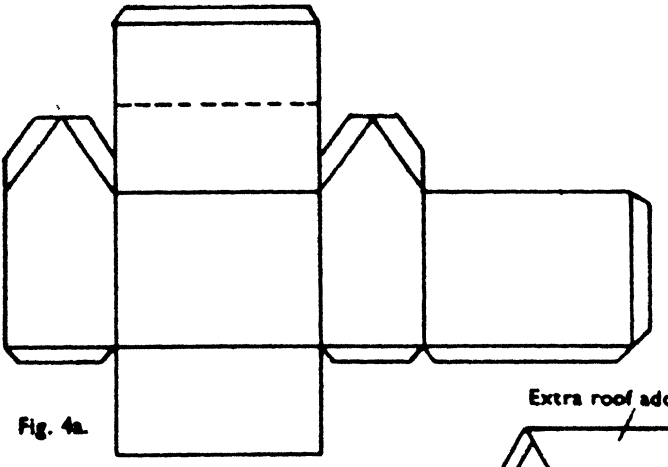


Fig. 4a.

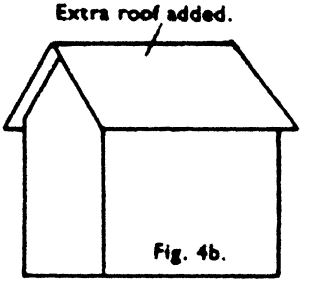


Fig. 4b.

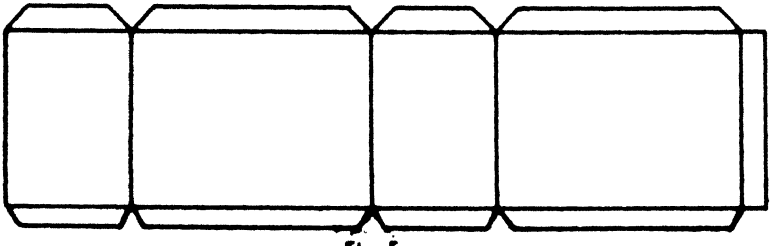


Fig. 5a.

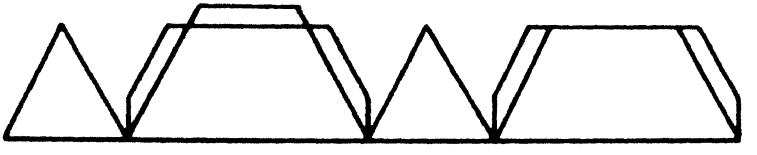


Fig. 5b.

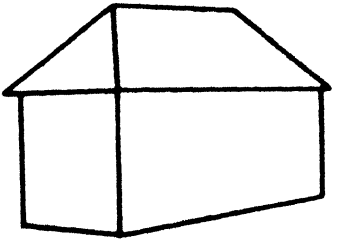


Fig. 5c.

Building with Hipped Roof.

The clay must be well prepared, and of a firm consistency, moist but not too wet. It is advisable for the children to knead the lumps of clay with their fingers to make it quite smooth.

Some form of flat smooth implement should be used for cutting the clay. An old ruler, or a modelling tool, if available, will answer the purpose well. It is important to remember that small pieces of clay should *not* be added to improve the shape, for this will inevitably break away when dry.

Making a Cottage in Clay. Decide on the approximate size of the building, and cut a rectangular block of clay to the maximum length, width and height required (Fig. 6a). Cut off the upper corners so as to make the shape of the roof (Fig. 6b). Press the ruler or modelling tool firmly against the two long sides of the building just below the roof to form the eaves (Fig. 6c).

If it is desired to join another small building, such as a "lean-to," to the main building, thin dowels or pegs (e.g. match-sticks) are inserted in the side of one building. The other is then pressed against it so that the pegs hold the two together (Fig. 6d). Smooth over the joined edges. When the clay has dried there will be little risk of the building separating.

SMALL SOLID BUILDINGS MADE OF WOOD

This type of model building can be made very quickly, and is especially useful if many small buildings are required. The buildings can be made either to exact scale, or roughly proportional to the size of the model as a whole. The height may vary from ¼" up to, say, an inch or two. Rectangular and triangular strips of wood are needed; for the smaller sizes stripwood can be used, and for the larger, deal strips of suitable size.

The buildings in the model of a modern city, described on page 89, were made by this method.

For very small solid buildings, take a length of small section rectangular or square stripwood, and with a knife shave the upper corners for the slope of the roof (Figs. 7a and 7b). Saw the strip into short lengths as required for each building.

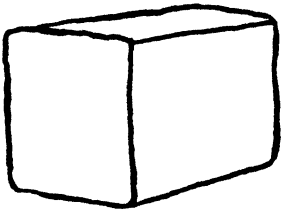


Fig. 6a.

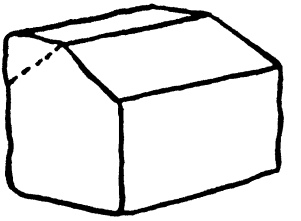


Fig. 6b.

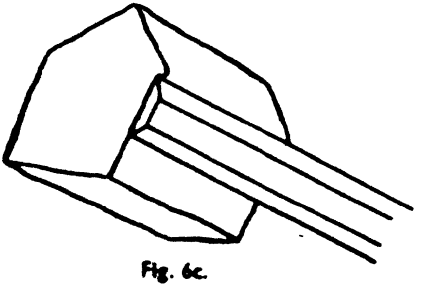


Fig. 6c.

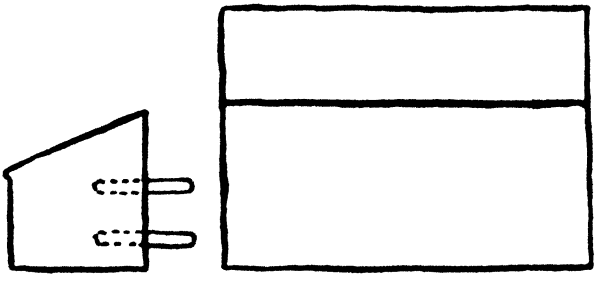


Fig. 6d.

For slightly larger sizes glue a length of triangular stripwood to one side of a rectangular strip (Fig. 8a). Saw this into suitable lengths to represent detached or semi-detached houses, a row of houses, or part of a larger building. Churches can be made in the same way, with a square tower, formed of an additional piece of square stripwood glued to the end of the house (Fig. 8b).

Factories can be represented by a rectangular block of wood, or several pieces of square stripwood glued together side by side, with rows of triangular stripwood glued to the upper side, as in Fig. 8c. Tall chimneys of dowel rod can be added. Various buildings of different shapes can be assembled similarly.

For a circular building, or a gasometer, if no suitable box can be found, discs of wood can be cut with a fretsaw, and glued together until the required height is built up. If the surface looks uneven it can be smoothed with file and glass-paper, and the top, if domed, can be shaped by similar means.

LARGER HOLLOW BUILDINGS MADE OF WOOD

The small solid buildings last described give excellent results on a small-scale model, but it is not easy to apply this method to, say, a model railway station big enough to accommodate small clockwork or electric trains.

For this purpose an entirely different method is employed.

The larger buildings are made hollow, thin wood, e.g., plywood being used for walls and roof. Since it is difficult to nail the edges of thin wood together at the corners of the building, square stripwood must be used to strengthen the joints.

In making such a building, the first step is to cut out, using tenon-saw or fret-saw, pieces of plywood the exact shapes for the front, back and ends of the model. When deciding the sizes for these it should be remembered that in this method the ends will overlap the front and back at each corner.

Window and door openings, if desired, must be cut out with the fret-saw at this stage.

The next step is to nail square pieces of stripwood to the inner side of each end of the house, parallel to the upright edges, but set back from them a distance equal to the thickness of the front

Fig. 7a.

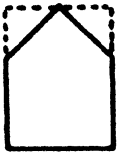


Fig. 7b.

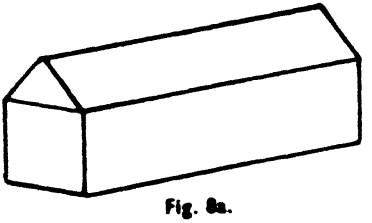


Fig. 8a.

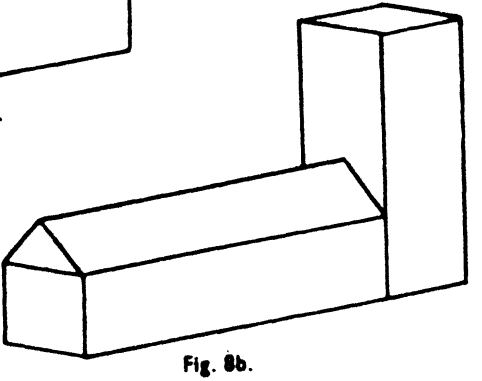


Fig. 8b.

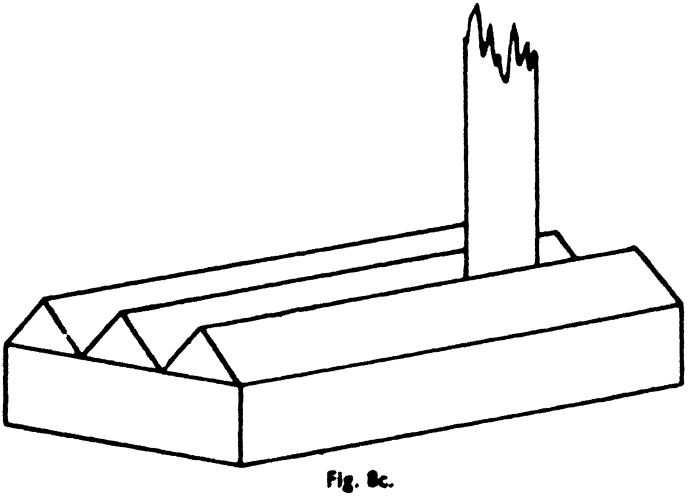


Fig. 8c.

and back of the house (Fig. 9a). It is best to glue each strip in position, and, when the glue has set, to nail it from the outside, through the plywood.

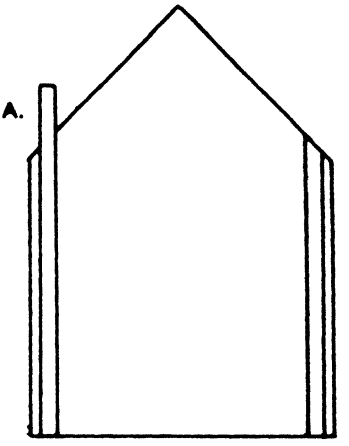


Fig. 9a.

If the building is to have a sloping roof, make the strips longer than they are finally needed, and cut off their tops to the slope of the roof after they have been fixed in position (Fig. 9a).

When each end is ready, the front and back are glued, placed in position on the ends, and nailed through to the stripwood at each corner. The stripwood should be supported on the edge of a table or bench when nailing the first joints (Fig. 9b).

For ease of drawing and construction, roofs are best made with an apex angle of 90 degrees. If any other angle is used difficulty will be experienced in obtaining a neat finish to the ridge.

Assuming a 90-degree roof, proceed as follows:

Cut a piece of square section stripwood, not less than $\frac{3}{4}'' \times \frac{3}{4}''$, long enough to fit between the two end walls, and glue and nail it in position as a ridge (Fig. 10).

Cut two pieces of plywood to cover the two halves of the roof with one piece overlapping the other at the ridge. Allow for

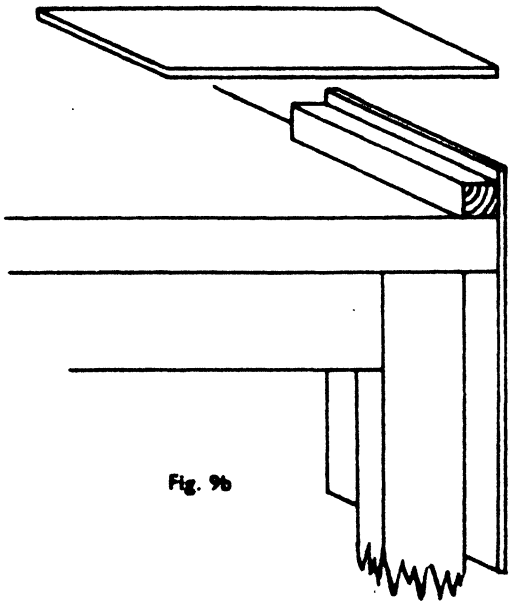


Fig. 9b

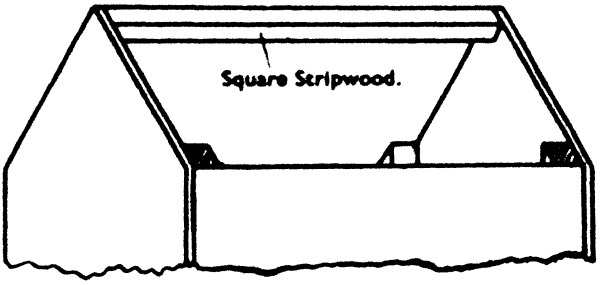


Fig. 10.

overhanging eaves on these pieces. Glue and nail these pieces down to the ridge piece and to the tops of the corner strips. This form of construction, besides being very simple, is exceptionally strong. It will be noted that the difficult process of nailing into the edge of thin wood is entirely avoided, as all the nails pass into the stripwood.

If a roof must be made with an apex angle other than 90 degrees the method is somewhat different. The ends of the house having been shaped, and the body of the house built up, pieces of square section stripwood are glued and nailed along the slopes on the inside of each end (Fig. 11). The two pieces of plywood for the roof are then cut to size as before, but without allowing for any overlap at the ridge. These two pieces are then glued and nailed to the sloping supports. It will be seen that this method leaves a V-shaped crevice at the ridge. This can be finished off neatly by filling with plastic wood, or by covering it with a strip of cardboard folded to fit the ridge.

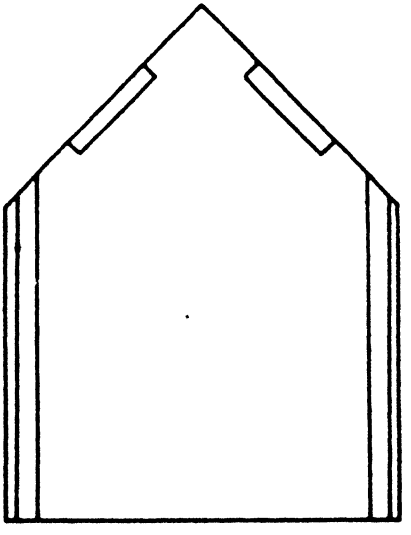


Fig. 11.

CHAPTER FIVE

METHODS OF CONSTRUCTION: (II) DETAILS OF BUILDINGS

WHATEVER medium is used for the representation of buildings, further interest is added by indicating the details, such as doors, windows, chimneys, and the materials which would be used for the walls, roofs, etc. These details can be shown in a variety of ways, according to the materials at hand, the ability of the children, and the aim in making the model.

TREATMENT OF WALLS

The simplest method for use on paper or cardboard is colouring with crayon, water-colour, or powder or tempera colour to the desired tint.

Clay and wood will successfully take a coating of powder colour. On large surfaces it is better to apply first a coating of size. Only if the model is likely to be freely handled is it necessary to use oil paint or enamel, for these generally give a less realistic effect than the rougher matt surface of powder colour.

Bricks. These can be indicated on paper or cardboard with pencil or brush, and coloured. Clay and plasticine can be marked with light impressions. A bought printed paper, representing brickwork, is most successful as a covering for large cardboard or wooden buildings.

Blocks of Stone. The effect of stonework can very easily be obtained by applying a coat of cement colour-wash. This wash consists of about equal quantities of Portland cement and fine sand, coloured if desired by the addition of powder colours, and mixed to a creamy consistency. It can be applied to cardboard,

clay, plasticine or wooden surfaces. It can also be used on clay, and if the wash is applied while the clay is still soft the actual stonework can be shown by marking with a fairly sharp instrument. A thin covering of plasticine over boxes or cardboard, with the addition of this cement wash, gives a very solid and realistic effect.

Roughcast. A search through a wallpaper pattern-book will often reveal good rough finished papers of natural colour which can be applied to the larger buildings in a model. A cement wash, as described above, of the required colour, can also be used to represent roughcast, or a mixture of paint and putty of a rather thick consistency will give an excellent effect. This mixture should be applied with a stiff brush used in all directions, so that the surface is left rough. It sets very hard and will stand much handling.

Plaster. Clay buildings can be tinted with a thin wash of poster colour to give an effect of plastered walls. A mixture of flour and salt can be applied to cardboard models, but this is apt to break off if handled to any great extent.

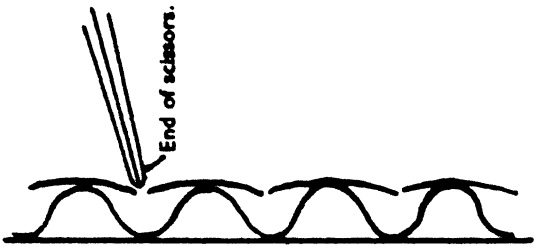
Timber. The timber framing of half-timbered houses can be shown by marking in crayon or soft thick pencil. Narrow strips of adhesive paper can also be used. The thinnest stripwood, glued to a large model, and coloured, gives a most realistic effect.

Logs. Corrugated paper faced on both sides is nowadays widely used for large packing-boxes, and can be readily obtained. If the paper facing on one side is lightly scored with the blunt end of the scissors along the corrugations (Fig. 1a) the effect of a log-built wall can be obtained on a model (Fig. 1b).

Weatherboarding (*Overlapping Boards*). Ordinary corrugated paper, well flattened, can be used to represent overlapping timber (Fig. 2). Shavings of wood glued to a cardboard foundation will give a similar effect.

TREATMENT OF ROOFS

Tiles or Slates. Roofs on small models can be coloured to represent tiles or slates. If a building is made by paper-folding



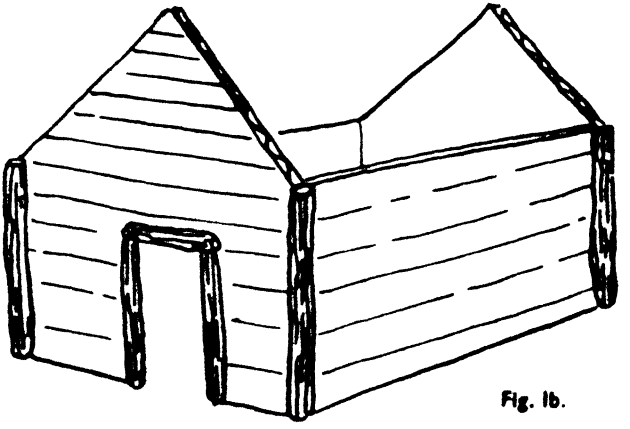


Fig. 1b.

Log Hut made from faced corrugated card and twigs.

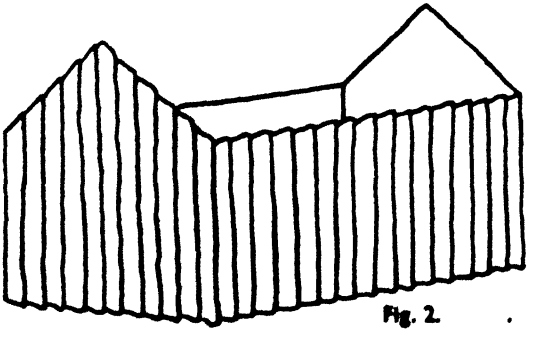


Fig. 2.

(page 38) and has no overhanging eaves, its appearance can be greatly improved by cutting coloured paper, slightly larger than the roof, and pasting it down (page 41). Printed tile paper can be bought and looks well on buildings of a fairly large size.

The effect of overlapping tiles is quite well indicated by using flattened corrugated cardboard in the same way as for weather-boarding (Fig. 2), but with the corrugations laid horizontally. A still more effective method of representing tiles is to cut thin strips of cardboard the same length as the roof. The individual tiles are marked, and cut part of the way up each marking to separate the tiles (Fig. 3a). Each strip is then pasted on to the roof, starting at the lower edge, and proceeding upwards, with overlapping (Fig. 3b). When the ridge is nearly reached, a start must be made on the other side of the roof; the last strip, along the ridge, must be a double one.

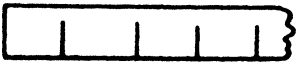


Fig. 3a.

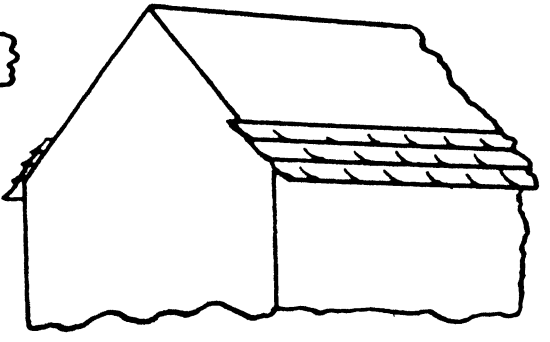


Fig. 3b.

Shavings or pieces of thin wood from strawberry baskets, or the thinnest plywood, can be used instead of cardboard.

Thatch. Thatch can be represented by colour washing, but this finish is not very realistic except on clay models. Here it will be found sufficient to paint the roof a yellowish colour, as the type of roof produced in a small clay model has a heaviness suggestive of thatch; the addition of straw, raffia, etc., tends rather to detract from this effect.

Split milk-straws, or raffia, can be glued to cardboard roofs but are not particularly satisfactory because they soon come off.

Raffia, however, can be quite easily sewn to cardboard. A piece of cardboard slightly larger than the roof is scored or half cut down its centre to form the ridge of the roof. A series of holes is pierced along the two edges parallel to this, and about ¼" apart. A few threads of raffia are taken and held down by a back-stitch between the holes. It is wise to stitch the raffia at top and bottom before proceeding to the next bundle (Fig. 4). The ends of raffia should be trimmed off to the edge of the cardboard when the stitching is finished. The cardboard is bent along its centre, and then attached to the remainder of the building with paste or glue.

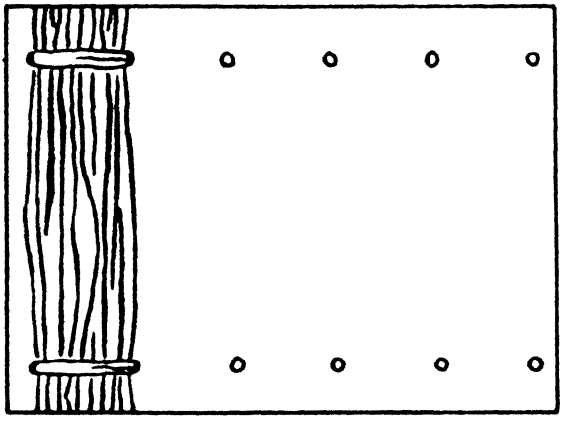


Fig. 4.

DOORS AND WINDOWS

It will be found that young children can indicate doors and windows by cutting an adhesive coloured-paper framing in one colour, and using pale blue or white for the panes of glass. They can be drawn and painted by older children on cardboard or paper. Clay or plasticine will take an impression, moderately deep, from a square or oblong stick (Fig. 5). Doors and windows in cardboard models can be cut with a knife, and in wood with a fret-saw (Fig. 6). This must obviously be done before the parts are assembled. An improvement on this

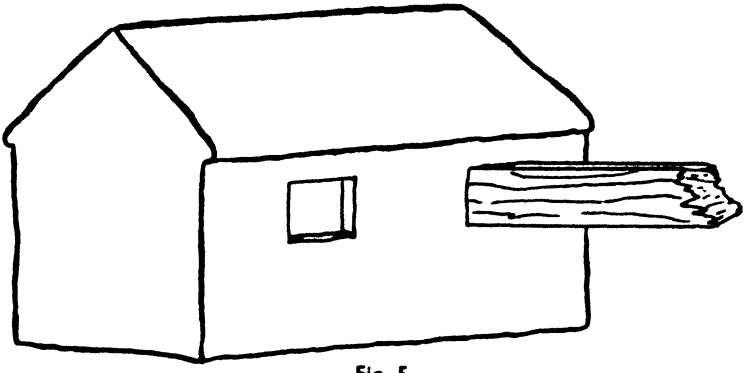


Fig. 5.

A square printing stick used to make windows

CHIMNEYS

In many cases on small models a stick inserted in a hole will indicate a chimney, if one is needed.

For larger models, a cardboard chimney can be cut, joined together and pasted to the ridge (Fig. 8).

method is to cut out a rectangular window space, and make a separate frame, larger than the window space, to allow for fixing (Fig. 7).

Glazing for Windows. A roll of adhesive transparent paper, which can be bought up to 1" wide, is very useful and easy to handle on small cardboard models. Cellophane, so easily obtained in these days, is a little more difficult to use, but is successful for quite large windows. It should first be soaked in water, and while wet, pasted or glued to the inside of the window-frame. When dry it will be found to have stretched tightly.

A thicker and much stronger cellophane is now available, but thin sheet celluloid (page 26) is better still for more advanced models in wood. Sometimes small pieces of mica can be obtained as "scrap." The celluloid or mica should be nailed down, and if a separate frame is made, as mentioned above, the celluloid can be placed between the frame and the wall, and nails put through (Fig. 7).

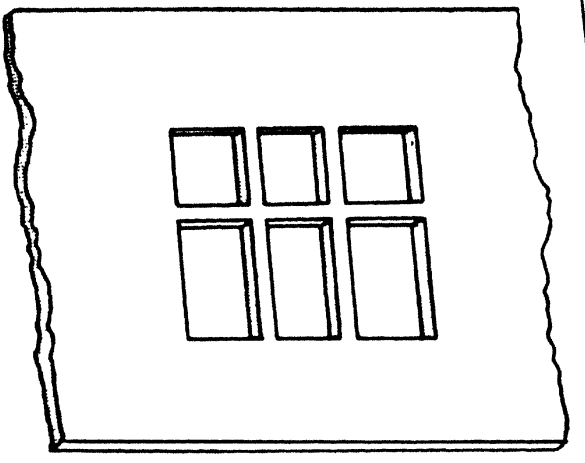


Fig. 6.

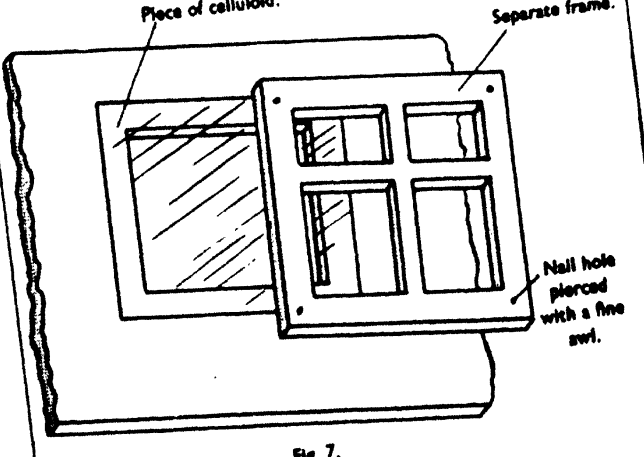

Piece of celluloid.
Separate frame.
Nail hole pierced with a fine awl.

Fig. 7.

A more detailed chimney in wood can easily be made. Two pieces of square section stripwood, each cut at an angle of 45 degrees and glued together, will fit a 90-degree roof. A flat top may be made of stripwood, and small pots, made of short lengths of dowelling or matches, can be fixed to the top (Fig. 9).

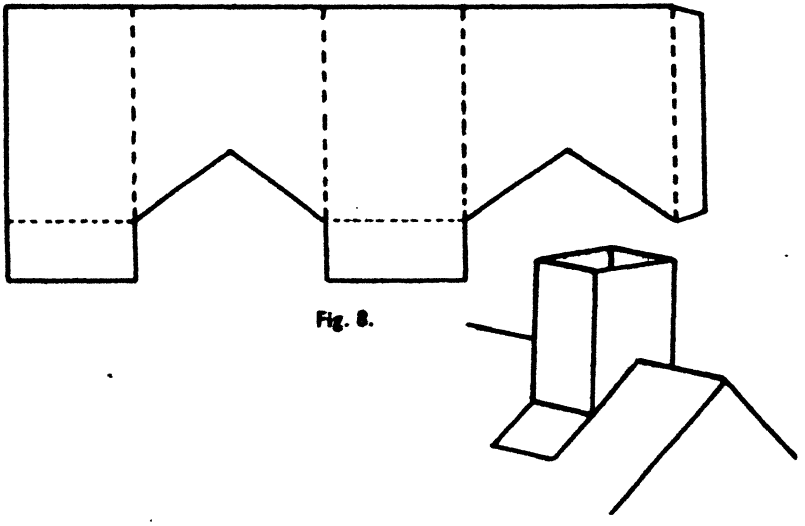


Fig. 8.

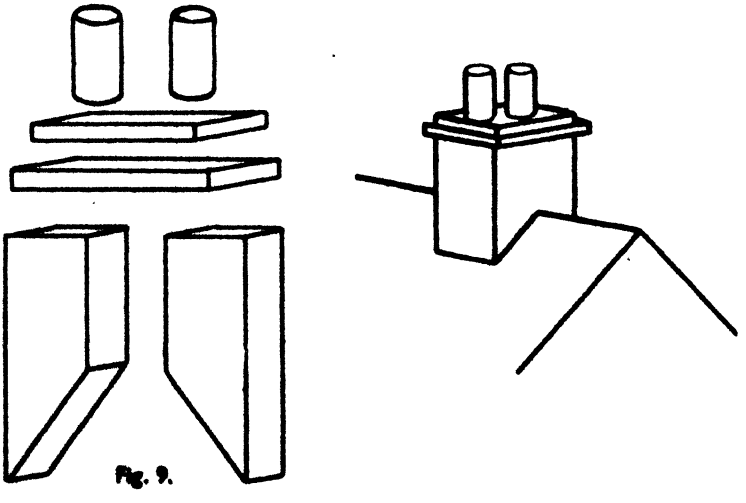


Fig. 9.

CHAPTER SIX

METHODS OF CONSTRUCTION: (III) DETAILS OF LANDSCAPE

INTEREST is added to all landscape models if various features such as trees, grass, roads, etc., are indicated in as realistic a way as possible.

There are various materials which can be used which will produce the required effect very easily and quickly.

Grassland. Grassland may be represented in several ways. The easiest way is to paint or enamel the base or ground work. This treatment is particularly suitable for small-scale models. For models of a larger scale a very good effect can be obtained by the use of turkish towelling dyed green and fastened down by dabs of glue or paste. A further method is to use sawdust finely sieved and dyed green to the required shade. The area to be treated should be brushed over with a thin hot glue or "liquid" glue and the green sawdust liberally scattered over it. When the glue has set any sawdust that has not adhered can be lightly brushed away.

On a very large scale model green raffia loops can be made on canvas by threading. The loops can be cut to the required height.

Small children delight in real grass, but this has to be sown at fairly frequent intervals if the model is in use for any length of time.

Trees. The different kinds of trees can be represented in various ways and in several materials. Real twigs, with the addition of paper shapes for flowers and leaves or fruit, can be used by young children who can also produce various types of trees by means of paper folding and cutting. Tree shapes with a small flap at the bottom to act as a stand can also be drawn on thin cardboard, cut out and coloured. A variation of this,

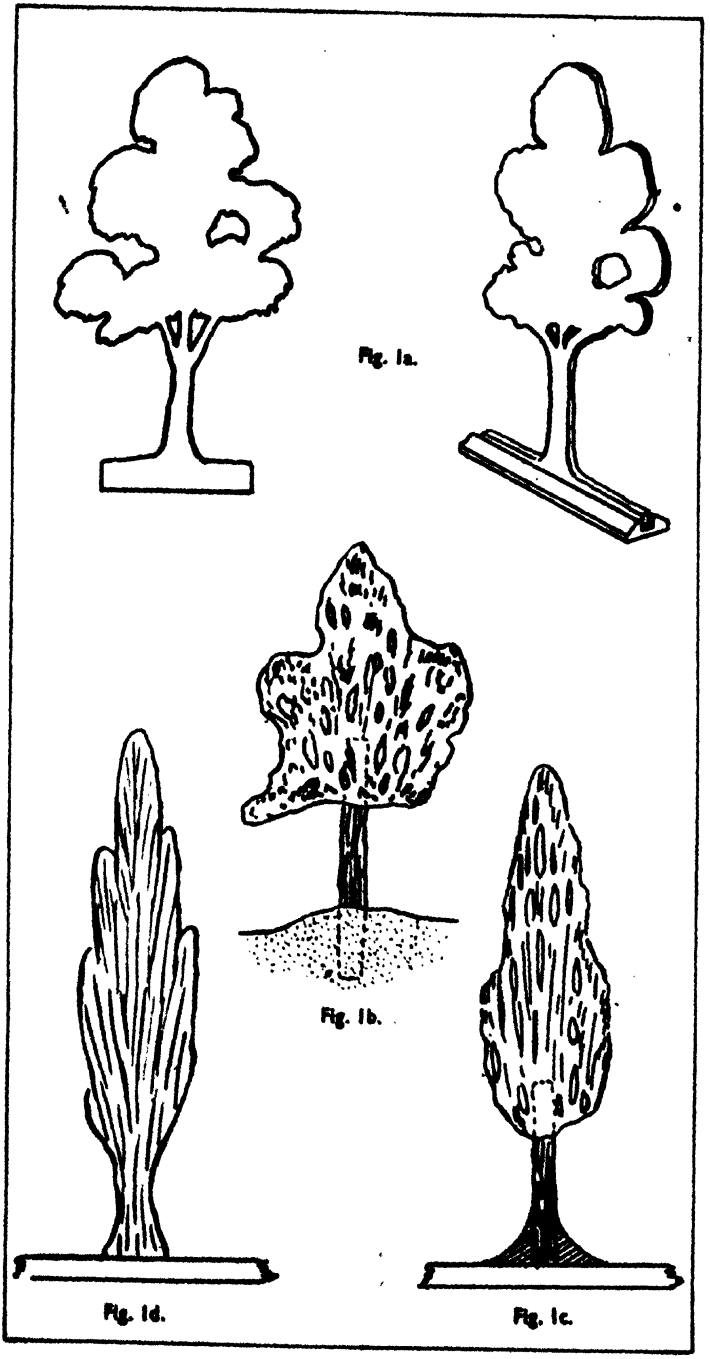


Fig. 1a.

Fig. 1b.

Fig. 1d.

Fig. 1c.

which will appeal particularly to the older boys, is to cut out tree shapes in plywood and mount them in grooved wood, which can be easily obtained from any shop catering for fret workers (Fig. 1a). Afterwards, these may be painted realistically with any kind of paint. All of these shapes have, however, the disadvantage of being flat.

Bath loofah or sponge dyed green make excellent trees, hedges and bushes. For bushes cut the loofah to the shape and size required, dip it in hot glue so that a small quantity adheres to one side and place in position on the model. For hedges cut the loofah into thin strips apply glue to one edge and then place in position. Trees may be cut to any desired shape according to their species. The trunks of the trees can be made from matches, twigs, or small dowels. They should be cut longer than they are actually required to be. Glue one end of the trunk and push it into the loofah. This completes the tree which can be made to stand by inserting the lower end of its trunk (previously dipped in glue) into a hole of a suitable size in the papier mâché (Fig. 1b). Alternatively, if there is no papier mâché on the base the lower end of the trunk can be covered with a cone of plasticene which should be pressed firmly down on to the base (Fig. 1c). In some cases shapes can be cut so that they can be glued down to the model without any further addition (Fig. 1d).

Roads. Roads and paved surfaces in general may be represented by paint or enamel, or better than either of these, a cement wash (page 50). Another method, although not perhaps so good as the preceding one, is to brush the road over with thin glue and scatter sand over it.

Various products of the seedsmen, such as hemp seed, will provide the cobbles for a cobbled surface. A very thick cement wash should be brushed over the surface and the seeds thrown on fairly thickly. These become embedded in the cement and remain firmly fixed.

Rocks. Realistic rocks can be made from a paper pulp.

Tear newspaper into fairly small pieces and soak thoroughly. Squeeze the water from these, making them into small rough

shapes and place in a bowl containing paste. When they are thoroughly pasted, place in position on the model and press firmly together. At least a week is needed for them to dry, after which they can be suitably coloured.

CHAPTER SEVEN

THE MAKING OF FIGURES AND ANIMALS

THE addition of figures gives considerable interest to models, when the scale permits them to be used, and the dressing of them in the costumes of various historical periods forms an excellent activity for older children.

OUTLINE FIGURES

Human Figures in Paper, Cardboard or Wood. A very simple method of making figures is to use a flat cardboard outline (Fig. 1). This can be drawn by the teacher to the size required, duplicated in numbers, and cut out by the children. A "rag bag" will provide suitable scraps of material with which the children will delight to dress the figures. A support for standing is attached after the figure has been dressed.

The figures shown in Plates IX and XI were made by this method. They are about 3" high, to conform to the scale of the model, and are placed in various natural positions on it. Larger figures of cardboard can be used, but stand less easily and are less realistic.

Small paper figures can be made in a similar way from duplicated copies, and "dressed" either by colouring or by sticking flat pieces of material to the figure.

Wooden figures are made by cutting round a traced outline with the fret-saw, or by sticking a picture on to plywood and cutting the outline similarly. If this second method is used the cut edges of the plywood may be coloured to match the picture. Figures cut from a traced outline will, as a rule, be painted all over after cutting.

Wooden figures may be made to stand by fixing them into grooved bases, similar to the method described for trees on page 60.

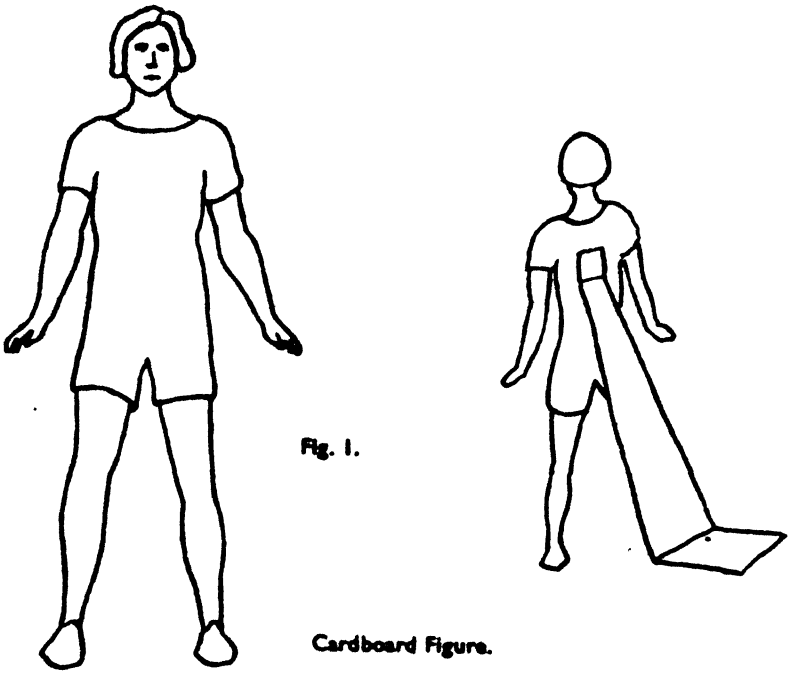


Fig. 1.

Cardboard Figure.

Animal Outlines. All the methods just described are equally suitable for making flat models of animals. Some of the animals in the "Zoo" model in Plate XIV, and all those in Plate XV, are paper cut-outs. The horses in the "Canterbury Pilgrims" model (Plate XVII) are single-thickness plywood cut-outs.

Duplicated outlines of human and animal figures should not always be provided. The children should have ample opportunity for free drawing and free cutting.

"*Layered*" *Animal Outlines.* The animals which are attached to the "Transport" models on Plate XII, are made of two, or in some examples three, plywood cut-outs stuck together. In the case of a model made from two thicknesses of plywood, the outline of each is identical except for the legs. As will be seen from Fig. 2a and 2b, these are so arranged that the legs on one side do not come opposite, and so conceal, those on the other. When the two "halves" of the animal are fixed together the effect is as shown in Fig. 2c.

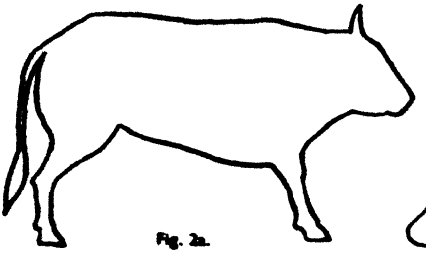


Fig. 2a.

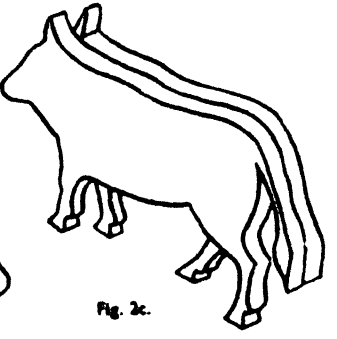


Fig. 2c.

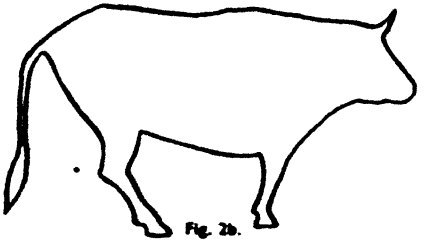


Fig. 2b.

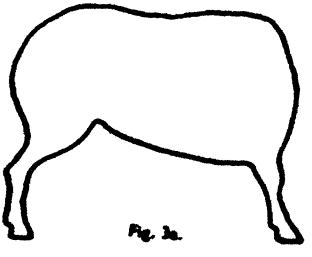


Fig. 3a.

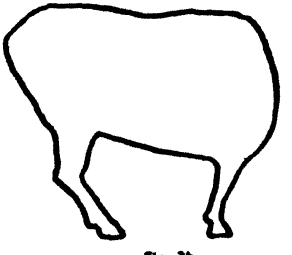


Fig. 3b.

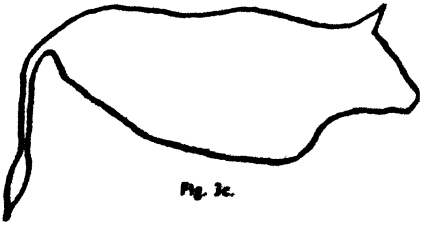


Fig. 3c.

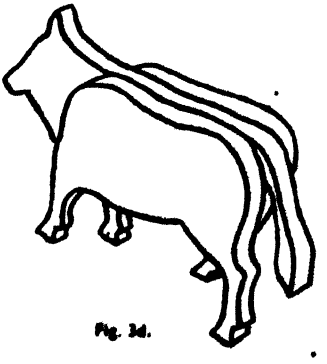


Fig. 3d.

An even more realistic model of an animal can be made if a third layer of plywood is placed between the other two, The two outer parts have only the body and the legs arranged as before (Fig. 3a and 3b). The third layer has the body, head and tail but no legs (Fig. 3c). The effect when the three layers are joined together is shown in Fig. 3d.

A little filing and rounding with glass-paper will make the model still more realistic, and these "layered" animals, if made from fairly thick wood, have the additional advantage that they will stand up.

SOLID FIGURES

It is a great advantage to make model figures which can be viewed with equal satisfaction from any angle. If, in addition to this, the figures can be made flexible, so that their postures can be adjusted at will, the result is even more realistic.

Flexible Human Figures. One method of achieving these objects involves the use of wire pipe-cleaners. A small figure can be made from three of these (Figs. 4a and 4b). The head is covered with crepe paper and stuffed with paper or cotton wool. This type of figure is shown in Plate XIV.

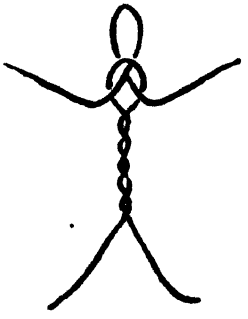


Fig. 4a.
Head and arms passed through.

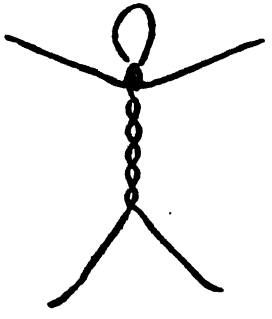


Fig. 4b.
Twisted tightly.

A larger figure can be made from five pipe-cleaners (Figs. 5a and 5b). This produces a shape about 8" or 9" high, and must be given breadth to make it proportionate. Cotton wool, cut into strips 1" wide, wound lightly round the figure, will do this, and can be manipulated to produce considerable variation in form. Strips of paper can be wound over the cotton-wool if the figures are frequently to be dressed and undressed (Fig. 5c) The head is covered with the end of a finger from a cotton glove, or with a piece of stockinette.

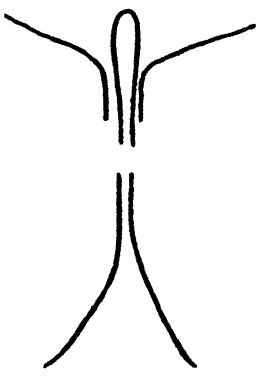


Fig. 5a.

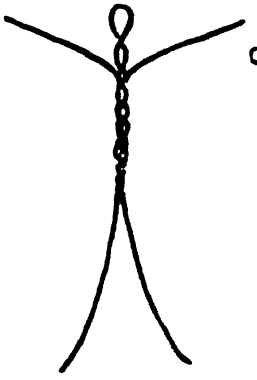


Fig. 5b.

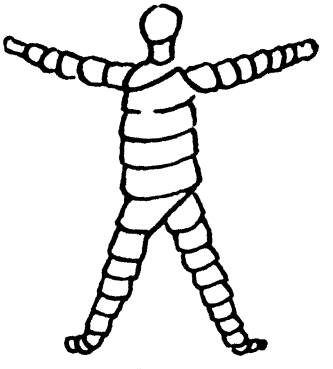


Fig. 5c.

These figures are too tall to stand without some support. They were used for the figures of the "Canterbury Pilgrims" shown in Plate XVII.

A much stronger flexible figure can be made from single-thickness lead-covered electric cable, which can be bought quite cheaply from any large shop dealing in electrical accessories.

A large roll of narrow tape, and a quantity of cotton-wool cut up into 1" wide strips, are also needed.

To make the figure, cut a length of the cable twice the height of the figure, plus an allowance for the feet, and another length equal to the height of the body from neck to ankle, for the arms. Double the first length to make the body and legs, leaving a loop at the top for the head (Fig. 6a). Turn up the two ends for the

Fig. 6a.

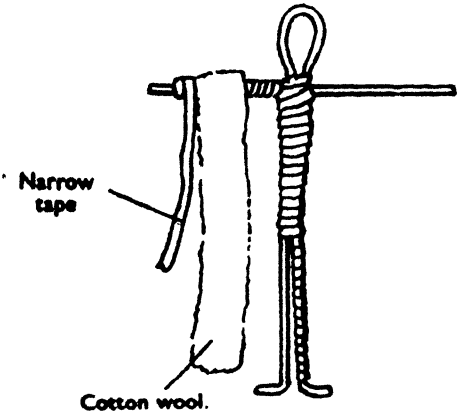


Fig. 6b.

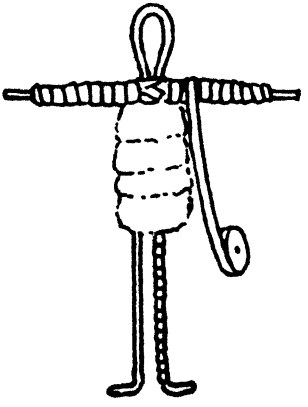


Fig. 6c.

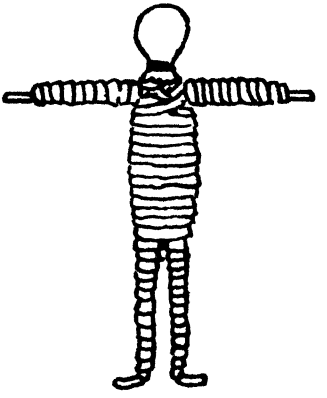


Fig. 6d.

feet. It is better to allow a double turn, to make a heavier and firmer base for the figure to stand on.

Join the piece for the arms to the doubled piece for the body in the correct position, fixing firmly with thin wire or string (Fig. 6b).

The figure when finished will be completely covered, with the exception of the feet, hands and head, with a binding of tape, a padding of cotton-wool, and a second binding of tape to protect the padding. This is done in the following manner:

Begin to bind with tape at one ankle.

Continue binding for the length of the leg, and then bind the double cable together as far as the shoulders, to make the body.

Cross the shoulders with the tape several times, very firmly.

Continue down one arm to the wrist.

The tape is now to be returned up the arm for the second binding, but before doing so, place a strip of cotton-wool in position on the lower arm, and wind round to the shoulder for the padding (Fig. 6b). The padding can be made to vary the outline of the figure by winding tightly or loosely, so giving shape to the limbs and body.

Follow the cotton-wool with the tape very carefully, so that all the padding is covered, and continue with the first binding down the other arm.

Pad with cotton-wool as before and wind the tape back to the shoulders.

Pad the body to the required shape with cotton-wool, and cover with the tape (Fig. 6c).

Take the tape down the second (uncovered) leg for the first binding, and return after padding, as for the arms.

The first leg, which has already been bound once, is now padded, and covered with the tape, which is thus returned to its starting-place.

The end of the tape is *securely* fastened, either by stitching or with glue (Fig. 6d).

Cover the head as in the second pipe-cleaner figure (page 66), taking care to bind all the edges of the head covering very firmly

by winding a good length of strong cotton over them, thus forming the neck.

Hammer the feet and hands flat, and paint them with flesh-coloured oil paint.

Mark the features lightly in pencil, paint or embroidery cotton.

Sew crepe hair to the head in the required fashion. Plates XVI and XX show the use that can be made of figures constructed on this method.

Modelled Animal Figures in Clay and Plasticine. Before animals are modelled in clay or plasticine, the children should have had ample opportunity of observing their forms, either from the real animals, or from good models or pictures.

Animals modelled in clay, and dried, can be painted with water-colour or tempera colours, or with oil paint. They have, however, the disadvantage that they are very fragile and cannot be satisfactorily mended.

Plasticine animal models have not this disadvantage, but their appearance is unattractive unless they are painted. This can be done as follows:

After modelling, dip the animal into glue size which has cooled sufficiently to become thick. This is best done by impaling each model on the end of a knitting needle for dipping. Place the needle in a flower-holder so that the model can drain and dry. This coating of size hardens the surface of the plasticine and makes painting with poster or powder colour possible. The model should be left on the needle while it is being painted and while the paint is drying. Most of the animals in the "Zoo" model (Plate XIV) were made and coloured in this way.

THE DRESSING OF FIGURES

The dressing of figures offers considerable scope for the expression of the individuality of the child and much of this type of work is undertaken by the children in their own homes.

It is essential, however, to provide good illustrations for reference if historical or national costume is required.

Simple methods of dressing outline figures suitable for young children are given on page 62.

When however the object of dressing figures is to further a study of the costume of a certain period rather than to add interest to a model of a building or scene, there should be considerable discussion concerning colour schemes, the drawing of patterns of different parts of the garments and the type of stitches, etc., to be used, and the figures *must* be of adequate size if the work is to be successful.

It is helpful to make a collection of suitable materials including oddments of lace, gloves—silk, cotton and skin—old felt and straw hats, beads, etc.

Patterns for all kinds of historical garments can be drawn from the sketches found in books on costume or social life such as those listed on page 117.

All the tunics worn by the men and women in the Saxon scene on Plate XVI and many of those of the Canterbury Pilgrims on Plate XVII were made from the same simple pattern with slight adjustments of length and width and length of sleeve.

The decoration of the garments forms an interesting part of the work. The younger children are able to print simple borders with potato- and lino-cuts or printing sticks. The mantles and edges of the tunics in Plate XVI are bordered in this way, the designs being made after study of authentic Saxon patterns. The material for the Knight's cloak and the Squire's tunic in Plate XVII was printed all over from children's designs made from potato-cuts.

The older girls will find much use for embroidery in motifs and borders as shown in the exquisite stitchery in the Georgian costume in Plate XX.

The children will quickly suggest ingenious methods of producing details of clothing. On Plate XX the fingers of kid gloves provided the shoes; silk gloves, the hose; pearl beads threaded on pins, the jewelled hair ornament, and the centre of the crown of an old straw hat was made into the charming one seen on the Georgian Lady.

PART TWO

EXAMPLES OF COMMUNAL MODELS

The models shown in Plates XIII and XX are the work of senior children. Those in all the other Plates (including the Frontispiece) are the work of children of 6 to 10 years of age It is obvious that many of these junior models can be adapted to be suitable for making by older boys and girls, so as to demand greater detail and more accurate scale work, the use of more resistant materials, a greater precision in execution, and a higher standard of artistic finish.

A SAXON VILLAGE

(FRONTISPIECE)

THIS model was very quickly made, and was planned mainly to show the open field system of agriculture.

The base was completely covered with dyed turkish towelling, with the exception of the fallow field, the roads and river. The towelling for two of the large fields was dyed yellow to represent the crops. The third field, which would be fallow, was covered with corrugated paper painted brown.

The three fields were marked into strips by paint, and by narrow pieces of green towelling which represented the grassy "balks." The meadow land by the river and the common lands which stretch away from the village, were shown by green towelling. The church, manor house, a few cottages and the mill formed the buildings.

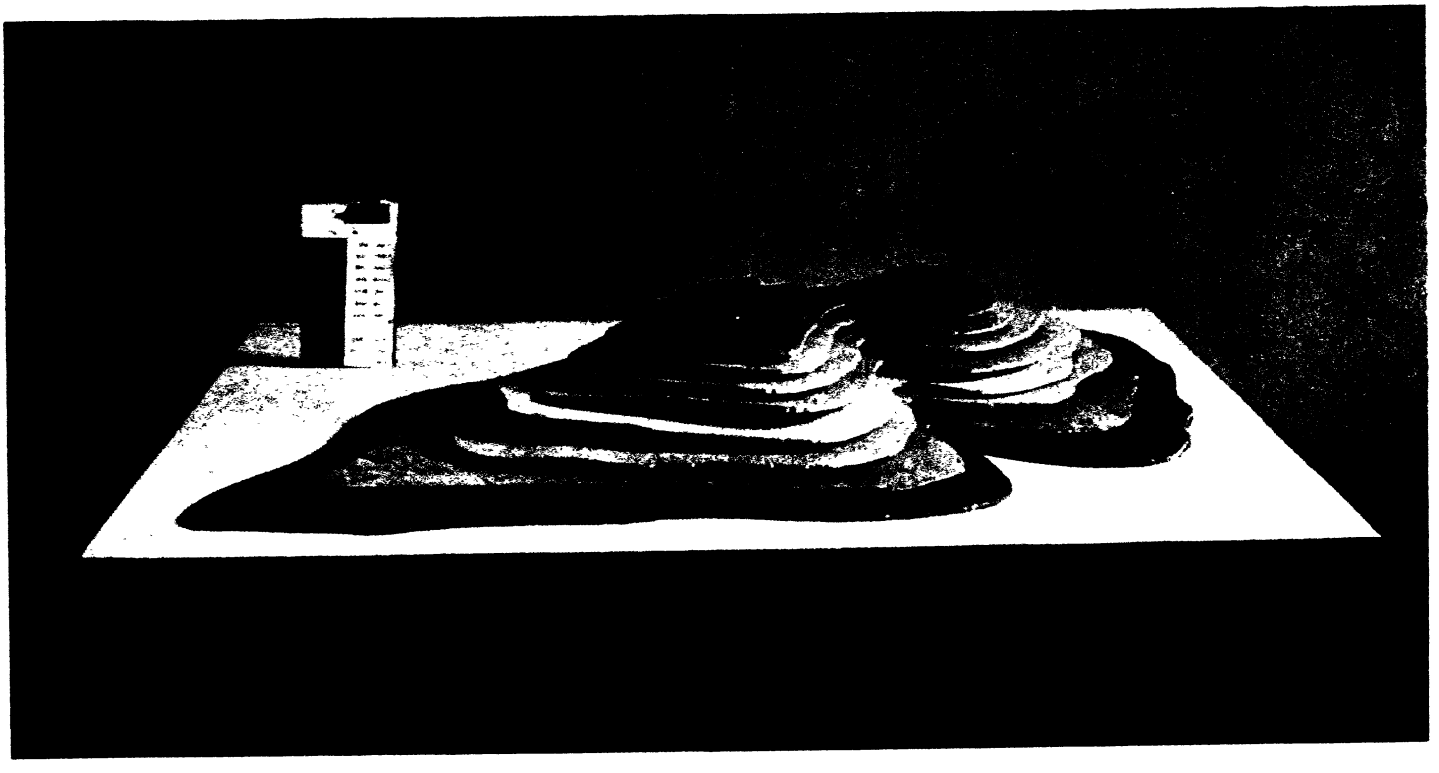
The church and manor house were made in clay to represent stone. These were copied from pictures, the former from that of a Saxon church still in existence. The other buildings were made in double-faced corrugated cardboard scored to represent logs (see page 51). Four walls were cut and joined together by pasting strips of linen on the inside of the corners. Small twigs were then glued to the outer corners and round the doorway to represent the supporting logs (Fig. 1b, page 52).

The thatched roofs were made by sewing raffia to cardboard (see page 54), which was then glued to the edges of the gable ends of the walls. A hole was made for the chimney.

The mill is a building similar to the cottages, with the addition of a mill-wheel, formed by joining two discs from milk bottles with small pieces of thin cardboard.

The wooden fences round the fields growing crops, which would be partly removed after the harvest, were made from brown corrugated paper obtained from chocolate boxes.

The method by which the land was shared between the inhabitants of the village was shown by placing labels bearing imaginary names on each of the strips.



A CONTOUR TEACHING MODEL I.

Pieces of plywood were used to build up the contours marked on the base as shown in Plate II. These are separated by small blocks of wood which can be changed so that the vertical intervals can be adjusted to suit those on any map (*see p. 73*)

A CONTOUR TEACHING MODEL 2.

The photograph shows the base of the model illustrated in Plate I. with the contour lines marked and coloured as on a map. The "key" showing the scale of heights is hinged and hence can be placed in either a vertical or horizontal position.

A CONTOUR TEACHING MODEL

(PLATES I and II)

THIS model was made by junior boys, but it is equally suitable for senior children. It is invaluable for the teaching of contours and should be made as substantially as possible so as to stand up to hard wear. Unlike all the other models described in this book, this can be regarded as a piece of permanent teaching apparatus.

The materials used were:

Plywood, 4 mm.
Deal strip, planed, 1½" × ½".
Stripwood, 2" × ¼".
Dowel rod, ¼" diameter.
2 blocks of deal, 2" square, 1½" thick.

A base was made up from plywood, strengthened with the 1½" × ½" deal strip placed on edge. One centre support was put in the framing (see page 29). In this model the corners of the base framework were dovetailed by the teacher, but this is not essential; nailed joints will serve the purpose.

The contour lines were marked out clearly in pencil on this base. From these, tracings of each separate contour were made, and transferred to plywood, to be cut out separately. This was done by the boys, using fret-saws, with which tools they were reasonably expert.

Two ¼" holes were drilled through the base, approximately at the centre of each "peak" of the contours. Each individual contour piece was then placed in its correct position on the base, and was marked from below by drawing with a pencil through the holes in the base. A ¼" hole was then drilled through every mark. It will be noticed that each of the lower contours has two holes, and the upper pieces only one.

The two blocks, 2" × 2" × 1½", were then drilled through their centres with the same bit, and a piece of ½" dowelling, about 8" long, was glued into each hole (Fig. 1a). 20 distance pieces, to put between the contour pieces, were then made as shown in Fig. 1b. 16 of these are 2" × 2" × ½"; 4 are 1" × 1" × ½"; each has a ½" hole in the centre.

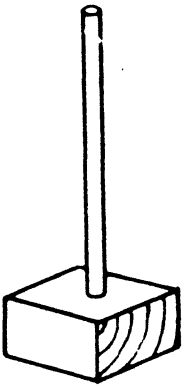


Fig. 1a.

Contour Model.

Fig. 1b.

The pieces of dowelling, now mounted on the blocks, were pushed through the holes in the base from underneath, so that the dowels stood as upright pegs above the base. When the model rests on a flat table these blocks remain in position, because they are the same thickness as the depth of the base framework.

The largest contour piece (correctly positioned by its two holes) was pushed down the two dowels on to the base. One square of 2" × ½" stripwood was then pushed down each dowel, and the next contour put into place in the same way as the first. The assembly continued in this way until the small contour pieces were reached, then instead of using the 2" square pieces the 1" square pieces were put on the dowels, so that they did not show outside the edges of the contours (Fig. 1c).

The projecting ends of the dowels were then cut off about ½" above the top contour. At this stage a piece of plywood, about 1" longer than the height of the top contour, and 2½"

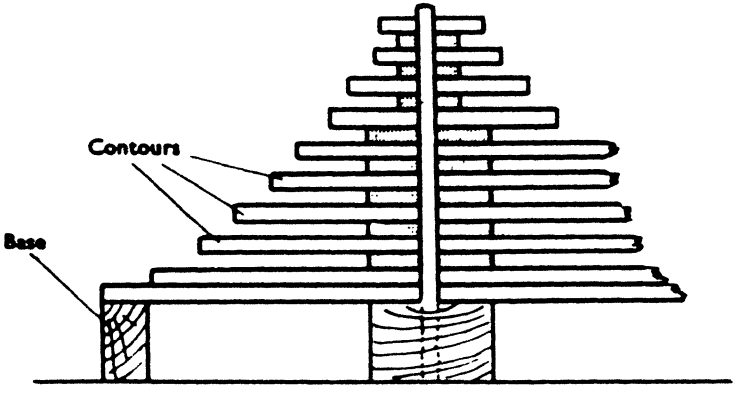


Fig. 1c.

wide, was cut, the "key" to the contours being painted upon this later.

The model was taken to pieces again, and carefully painted with enamel. The upright dowels, and the distance pieces used between the contours, were not painted. The map marked out on the base was carefully painted in the same colours as the corresponding contour pieces.

The final touch was to hinge on to the base the piece of plywood bearing the "key" to the contours, in such a way as to stand upright when the model was assembled, and to lie flat when the base was used as a map. An L-shaped piece of paper was clipped on to this, bearing the heights shown by the contours.

It will be seen from the foregoing description that the principle, and the construction, of this useful model, are very simple. It can be used either as map or model. The contour scale can be altered at will simply by changing the L-shaped paper. It is quite easy to make a similar model in wood or cardboard to illustrate any particular district or feature.

IMAGINARY LANDSCAPE: SEASIDE, RAILWAY GRADIENTS, ETC.

(PLATE III)

THIS model was planned to show as many natural features as possible through which a railway track might have to pass. Hence it had to be a landscape model.

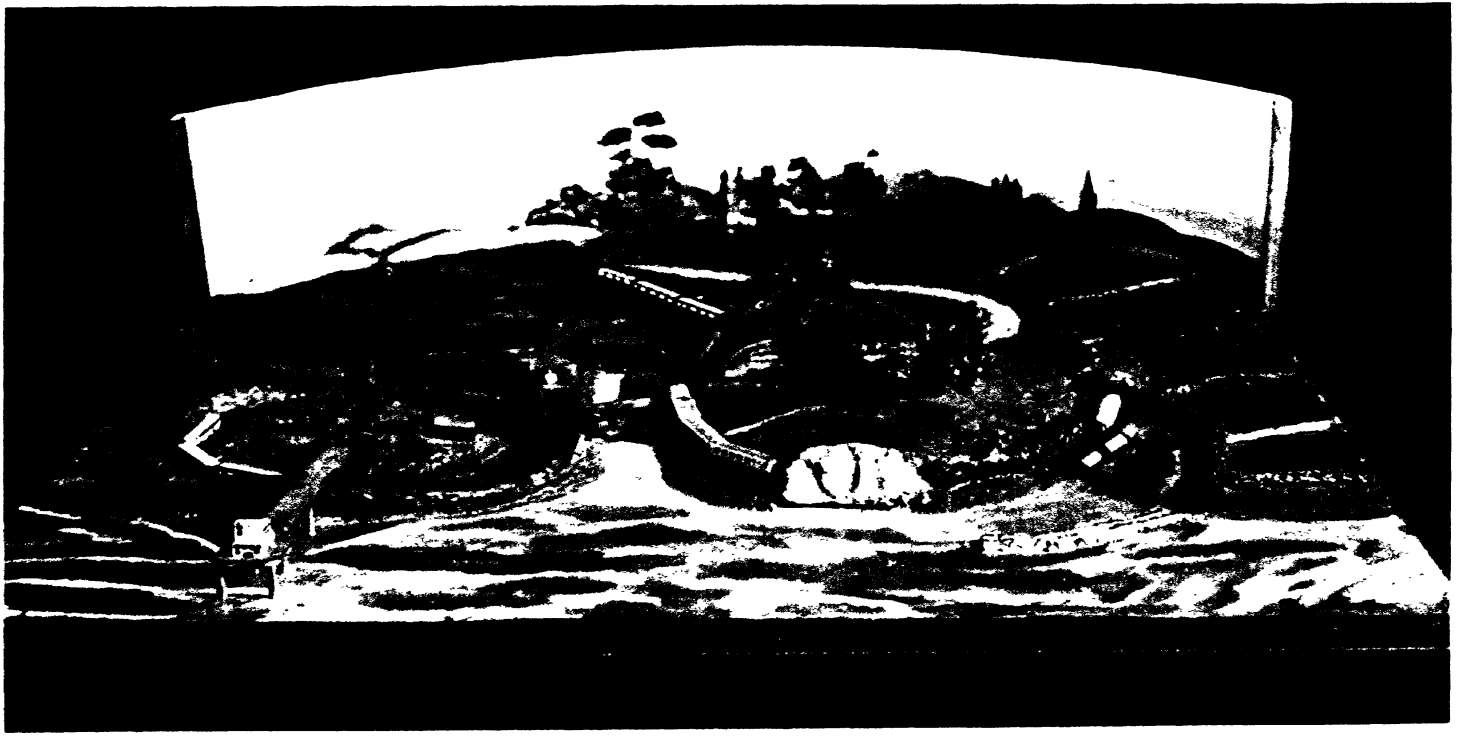
The first task was to make up a map of an imaginary piece of country which would involve a railway engineer in a considerable amount of difficulty.

Contours were included for class-teaching purposes, and to assist in the making of the model. The back of the map was made round, in order that a piece of painted scenery might be fixed to form a suitable background.

A framed plywood base of the same size as the map was made, and the map was copied on to it with coloured chalks. A large quantity of papier mâché was prepared, and several children, working with the contour lines as their guide, soon built up the groundwork. At two points tunnels were made by inserting lengths of tinplate bent to a U-shape, the succeeding layers of papier mâché being laid over them without closing their ends. Great care was taken in the making of embankments, cuttings and the approaches to bridges. The bridges themselves were added at a later stage.

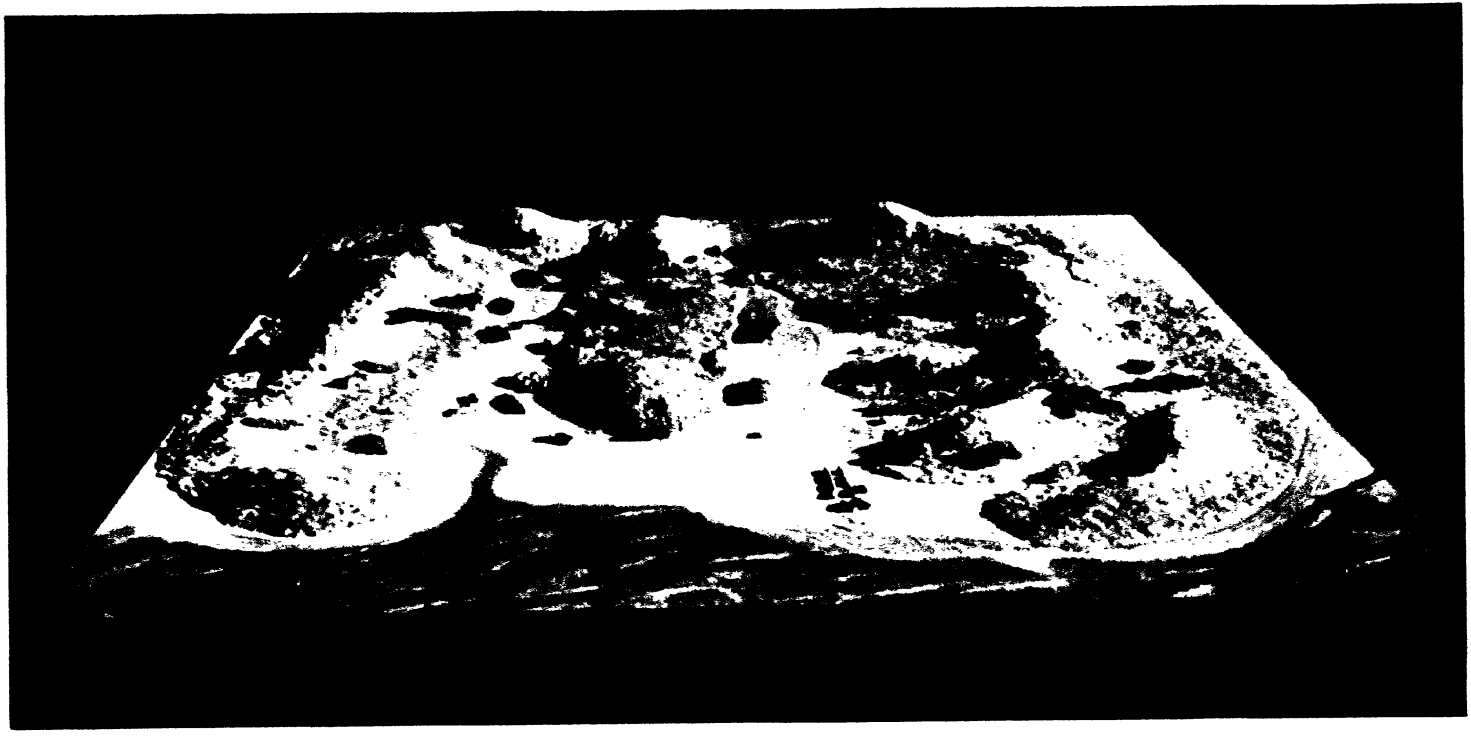
The groundwork and base were first given a coat of hot size, and then a coat of good paint. When this was dry the bridges were built in with grey plasticine.

Fields and hedges were next marked in and were then painted in their appropriate colours. The sea and the shore were also painted in at this stage. The shore itself might have been more realistically represented by sand on glue or by a suitably coloured cement wash. Hedges and tree shapes were cut from



IMAGINARY LANDSCAPE : Seaside, Railway Gradients, etc.

This model was planned to show as many natural features as possible through which a railway track might have to pass. Gradients of varying degrees, bridges and tunnels were made on a groundwork of papier mache.



REAL LANDSCAPE Sea, River, Valley and Mountains.

A small area was taken from an Ordnance Survey map and modelled in papier mache to show the natural features. The vertical and horizontal scale are approximately the same. The homesteads in the valleys add a human interest.

(see p. 78)

green-dyed loofah and were glued in position.

A few very small houses were made from stripwood to represent a town, and after painting, these were glued in position. The whole of the railway track was painted in brown and the lines were put in with thin black paint. A set of rolling stock was made up from stripwood and painted in the colours of one of our railway companies.

Painting the scenery for the background was a task for the teacher. When completed it was fixed to uprights; one was screwed to the centre of the back of the base and the other two placed where the curve of the back came to the sides of the base. The scene was nailed in position to the uprights and was held in front by the curve of the papier mâché.

Serious cracks appeared in the papier mâché due to shrinkage, and these were dealt with in several ways; some were filled with more papier mâché worked in with plenty of size, others were glued and some were hidden by bushes and trees of loofah.

REAL LANDSCAPE: SEA, RIVER VALLEY AND MOUNTAINS

(PLATE IV)

THIS model was designed to show how an area from an Ordnance Survey map can be modelled to indicate its natural features. When used in conjunction with the map, it is of considerable value as a teaching model.

The construction was very simple, and the materials used few and cheap.

First of all a suitable area was marked out on an Ordnance Survey map. From this the size of base and the scale of the model were decided. The scale chosen for this model was 1 foot to 1 mile, the same scale being used for horizontal and vertical distances, so as to give a true representation of the relations of the heights to the distances.

The height of the highest parts were worked out, and it was then decided to make the base extra strong, to stand the weight of the large quantity of papier mâché which would be needed.

The base, 4′ × 5′, was then made up from 4 mm. plywood and 2″ × 1″ deal used edgewise, two cross supports being added to strengthen the frame (see page 29).

A copy of the map was made in chalk on the base, the chief contours, the sea coast, and the rivers only being marked.

Large quantities of papier mâché were prepared (page 33). This was built up in 1″ layers, with constant reference to the contours on the map. When the whole map conformed to the shape shown by the contours, it was brushed over with hot size.

When the surface of the map was sufficiently dry, it was painted over with a thick green cement wash. Rocky parts were painted over this in natural colours.

The waterways were painted in blue, the roads in grey, and the railways drawn in Indian ink over the first wash. Wood-

lands were added in the form of thin strips of bath sponge dyed green. Small buildings were added after the painting was completed. The final stage was the painting of the sea.

The area illustrated in this model is a part of Wales, to the north of Towyn.

If possible, it would be a good plan to choose a local area, keeping its location secret. When the model is finished the area could be visited and compared with map and model.

PART OF AN ANCIENT GREEK CITY

(PLATE V)

THIS model was made by children of 9 to 10 years of age. It was not, of course, intended to be an exact model, but was to give the children some idea of the appearance and principal features of such a city, so that they might compare it with a modern city.

Pictures of reconstructions of various ancient Greek cities were studied, and it was decided to base part of the model on the Acropolis of Athens, and part on a reconstruction of Delphi.

Reference was made to scale plans of the Acropolis, the Parthenon, a Greek theatre, and a Greek house, so that the models of these and other buildings would bear the correct relation to each other in size.

The realism of this model would have been enhanced by adding groups of figures, for instance on the Processional Way, but owing to the scale these very tiny figures would have been difficult to make. As the children were all familiar with Birmingham Town Hall, which is a reproduction of an ancient Greek temple, and as they had studied pictures containing figures and buildings, it was decided to omit the figures from the model.

After the base was made, a rough plan was drawn upon it, and part of a hill raised in the background by means of two or three boxes graduated in size, as described on page 36. The rocky sides were built up, rocks being made by the method given on page 60, but pieces of coke were inserted here and there to add to the realism of the effect.

Steps were made leading up to the processional way. Boxes or blocks of wood, graduated in size, were placed at each turn of the steps to form a base or platform. A number of strips of

strawboard about 4" × 1" were pasted together (Fig. 1) and each length of steps thus made rested on two boxes.

The whole of the stairway was then boxed in with pieces of strawboard.

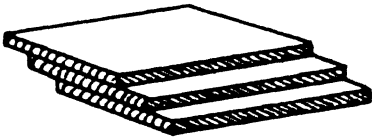


Fig. 1.

The Temples. All the temples were made on the same plan; each child in the class made one of the smaller temples, and the best were chosen to be used on the model. The larger ones were then made by individual children who were given measurements to work from.

The body of each small temple was made from a block of wood about 1" · 1" · 3", either in one piece or built up from printing-sticks or stripwood glued together.

To make the top of each temple, two pieces of 16 oz. strawboard were glued together. These were cut large enough to overhang the block by at least ½" all round. For the base, a piece of strawboard the same size was glued to one ½" longer and wider forming the step. Both the top and the base were then marked with the position of the pillars, and holes were pierced with a bookbinder's bodkin (Fig. 2a).

Thin round kindergarten sticks were then cut into pieces ½" longer than the height of the wooden block. These were inserted in the holes in the top, and the wooden block glued in the centre of the strawboard (Fig. 2b). This was then placed over the base, so that the pillars were resting on, or near, the corresponding holes already pierced. A little adjustment of the pillars and firm pressure from the top joined this with the base (Fig. 2c).

For the larger temples, dowels were used for the pillars and a large punch for the holes, also over the cardboard top which

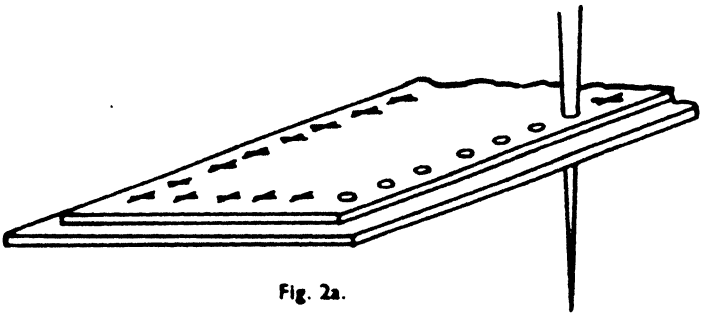


Fig. 2a.

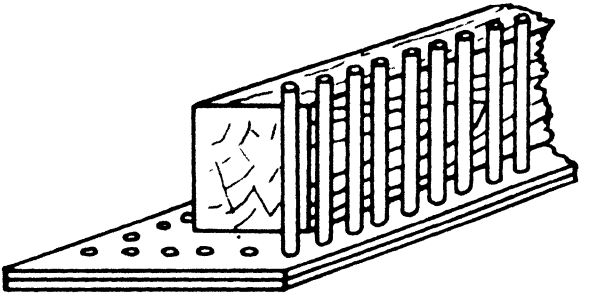


Fig. 2b.

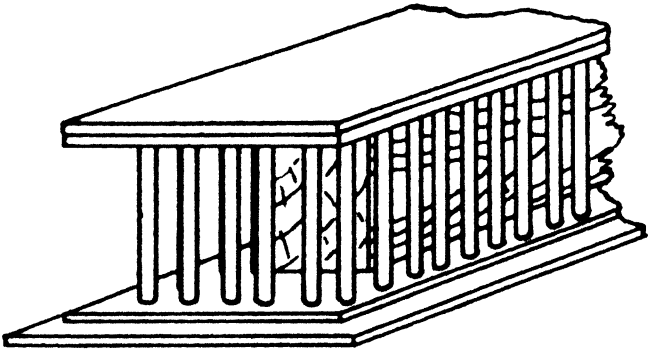


Fig. 2c.

received the pillars, strips of wood were placed level with the edges to represent the deeper architrave.

Two pieces of thin cardboard were then cut out and placed in position back and front about $\frac{1}{8}$" from the edge to represent the triangular pediment or ends of the sloping roof (Fig. 3). The wooden roof was represented by corrugated cardboard ironed flat.

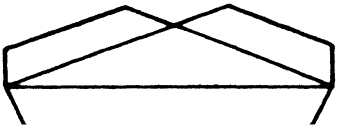


Fig. 3.

The Theatre. The theatre was made circular at first (Fig. 4a). It consisted of rings of strawboard graduated in size so that when placed one above the other they rose in tiers. The outer circle of each ring was cut with the scissors and the inner one with a fret-saw.

The rings of cardboard were glued together and the whole sawn across as at AB (Fig. 4a).

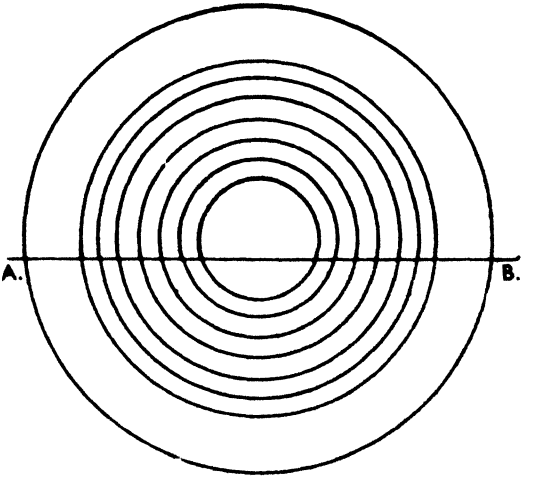


Fig. 4a.

Greek Villa.

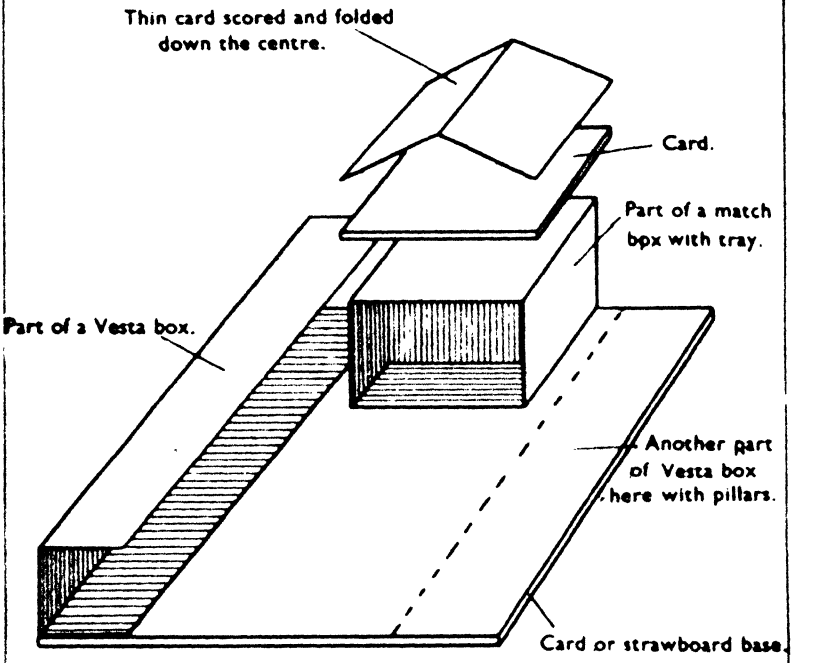


Fig. 5a.

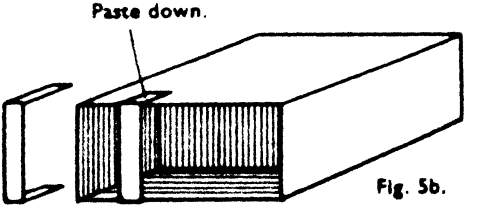
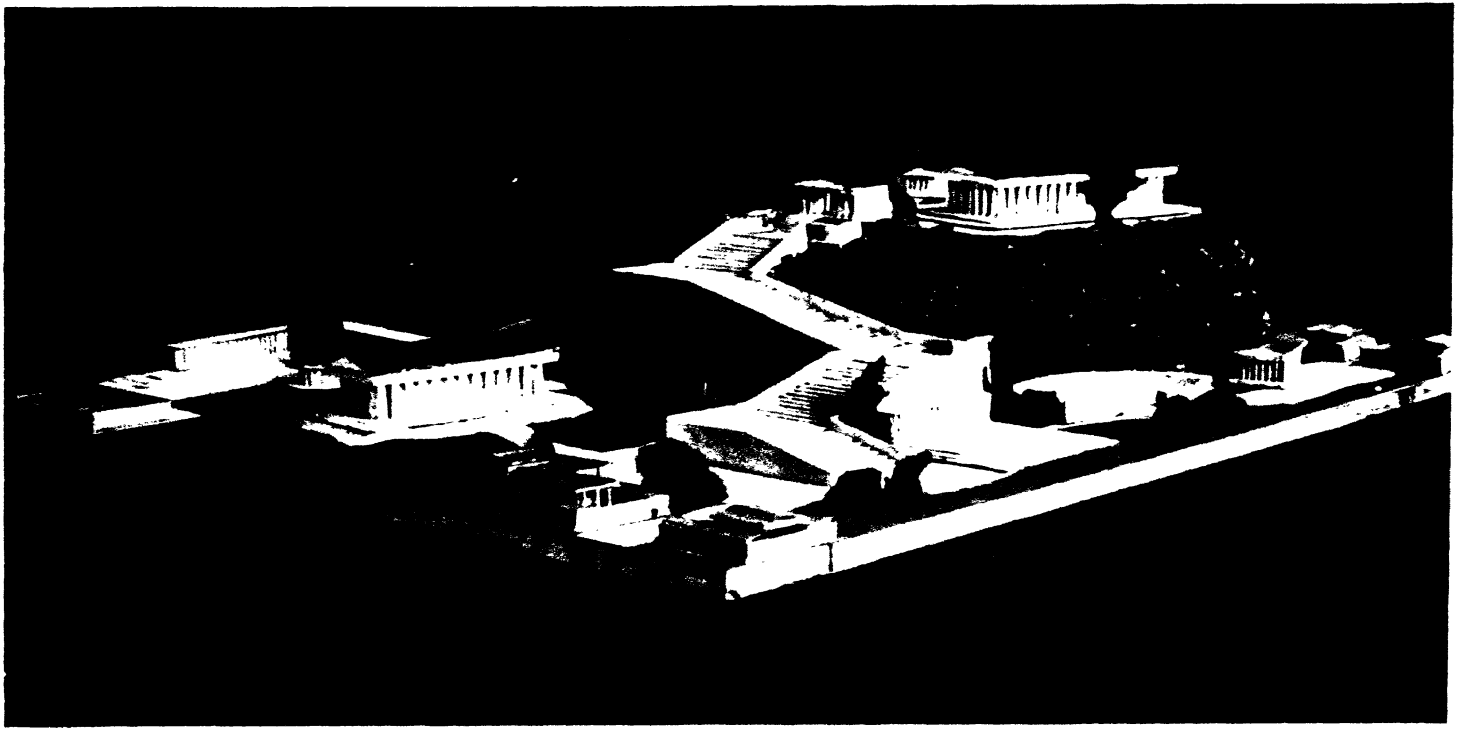


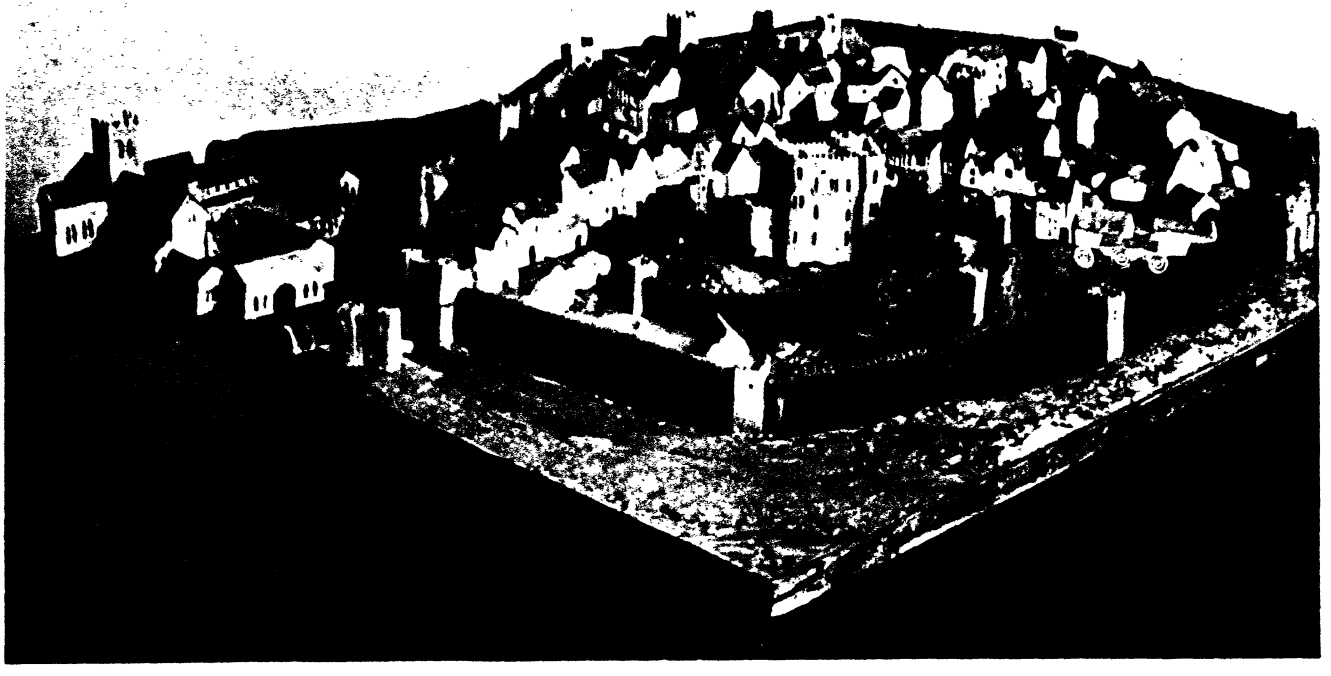
Fig. 5b.

Pillars are narrow strips of paper pasted over the end of match box.



PART OF AN ANCIENT GREEK CITY.

The dignity and beauty of classical Greece has been captured in this model although only very simple materials were used in the construction. It is based partly on a reconstruction of the Acropolis of Athens and partly on the city of Delphi.
(*see p.* 80)



A MEDIÆVAL CITY.

This model of a city of the 12th Century appears to be a huddle of buildings but was very gay and colourful with its red-tiled or yellow thatched roofs, washed plaster and timbered walls and grassy spaces. Two main intersecting streets leading to the city gates can be traced and also the Market Place with the Guildhall and Market Cross. Most of the buildings are made in clay. (*See p. 50*)

The sawn ends were faced with shaped pieces of cardboard (Fig. 4b).

The theatre was placed in position so that it appeared to be built into the hillside.

Fig. 4b.

The stage was made of small blocks of wood and thin cardboard from a picture of a reconstruction.

The Greek House. The house was made of match-boxes on a cardboard base. Figs. 5a and 5b show the construction. The whole was enclosed with strips of thin card pasted to the sides of the match-boxes to represent the outer walls. A small doorway was cut in the front wall.

The colonnades were pieces of fine corrugated greaseproof paper, such as is often used in packing biscuits, and were mounted between two pieces of thin white cardboard.

A MEDIÆVAL CITY

(PLATE VI)

THIS model was made almost entirely in clay and presented a very colourful appearance when finished. The period chosen to be represented was about the 12th Century, so that features of both Saxon and Early Norman times would be shown.

A discussion was held concerning some modern cities which we know were then in existence and which still have some typical features of cities of mediæval times. It was decided, if possible, to base the model to some extent on one of these. Warwick was chosen as it was a neighbouring city, and although there is now no trace of any buildings of the 11th and 12th Centuries, sufficient information was found, which together with the known position of old buildings still in existence, allowed a rough plan of the city to be made.

Naturally, the children knew that all the buildings could not be placed on the model, but realized that the total population of the city at that period would be about equal to that of the district immediately surrounding the school.

A base 4′ × 5′ was used and on this the position of the walls, gatehouses, etc., marked. It is known that there were several monasteries without the walls so space was allowed for one. A start was made on a simple contour built up of papier mâché, for the Norman Castle must be built on a hill.

Meanwhile the children started the making of houses in clay. The first type chosen to be made was the one-storey plastered cottage with thatched roof. These were made by the method given on page 43. Before setting aside to dry, impressions were made with small sticks for doors and windows (page 54). These were painted and the walls were also washed over with a cream tempera colour. The roof was also coloured as the clay was rounded to give the appearance of thatch.

Pictures were then studied of early mediæval half-timbered houses and a number were made similar to that shown in Fig. 1. A slightly larger rectangular block of clay was used than for the first houses and a piece cut away from the lower half to produce the overhanging upper storey. Small pieces of shaped cardboard were inserted underneath this edge to represent supports

Fig. 1.

and also, in some, small pieces of cardboard were inserted horizontally by the doorway to act as counters, as these later houses would be shops in the main street. Impressions were made for the windows and doors as before. Corrugated paper ironed flat was used for the roofs.

The roofs and walls were coloured and the timbering marked with pastels or soft thick pencils.

Other buildings were then made, Gatehouses, Guildhall, Castle Keep, and Market Cross. These were copied from pictures of buildings still in existence in other towns. Groups of children made these very quickly, adding all kinds of details as they became familiar with the possibilities of the material.

The walls were made of "Vesta" match-boxes interlocked as described for the Keep (page 94). Each length made was covered with a thin layer of plasticine which extended about ¼" above the edge of the boxes. The edge of the plasticine was impressed with a small stick or match to represent the castellations (Fig. 2). The boxes below the plasticine gave the thickness of the wall to the top of which steps were made also in clay.

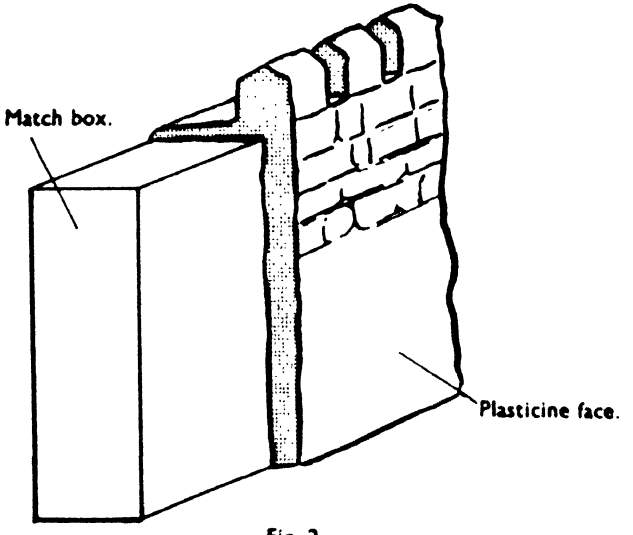


Fig. 2.

All these buildings which would have been made in stone were given a grey cement wash whilst still damp.

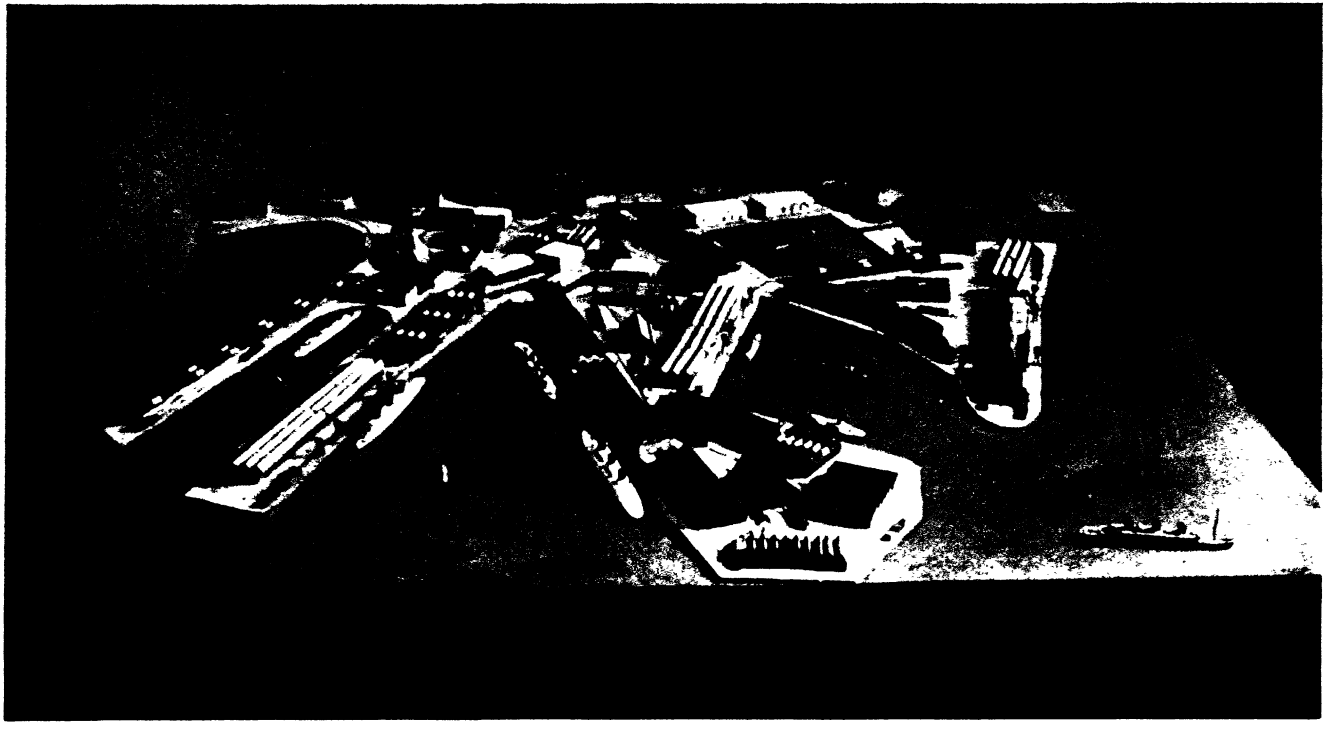
The monastery and churches were made of cardboard, the former being based on a plan of a Benedictine monastery. Groups of children each made a different building. The windows were cut with penknives and transparent adhesive paper placed behind.

The streets were first painted with a very thick brownish-grey cement wash. Hemp seed was then thrown on rather thickly while the wash was still wet. The seeds became embedded in the cement, giving the appearance of cobblestones.

All kinds of details, such as archery butts and lych gate were added and the remaining spaces painted green to represent pasture and cultivated land.

A MODERN CITY.

The chief features of a modern city are shown in this model in positions recommended in present-day town-planning schemes. The city radiates from the Civic Centre and the main shopping and office areas. The housing district is on the higher ground with many open spaces. The buildings are made of small blocks of wood. (*see p.* 80)



SOUTHAMPTON DOCKS

There is a considerable similarity between this photograph of the model of the main part of the docks and the aerial photographs which were consulted to give the position and approximate size of the buildings The plan on the base was drawn to scale Some of the ships are lead models of famous vessels which call at Southampton

A MODERN CITY

(PLATE VII)

THERE was a great deal of class discussion before this model was actually started. It was first of all decided that it would not be easy to make an exact model of any existing city. Reference was therefore made to a town-planning scheme to plan the model. A list was made of all the features that should be found in a city, and attention was paid to all communications and public undertakings. Once this list was complete it was possible to make the plan.

In planning the city the first things considered were the "shape" of the land, the course of the river and the canal. One or two contour lines were quite sufficient to indicate the "shape" of the land. Once this was done the river and canal were soon placed. Next, the important main roads were put in, then of course the positions of most of the features were obvious.

By this time it had been decided that the most suitable size of base for the model would be one measuring 4′ × 5′, so the next step was to make a copy of the plan in the same proportions, i.e., 8″ × 10″. This plan was made in much greater detail than the previous one and was made on graph paper in order to facilitate enlargement when transferring it on to the base.

A base was prepared from 4 mm. birch plywood and 2′ × 1′ planed deal, as described on page 29. On this the contours were marked in chalk.

Large quantities of newspaper were put to soak in bowls to make the papier mâché required to cover the contours (see page 33).

The papier mâché was put on as soon as possible, as it dries very slowly. As soon as it was dry enough to work on again it was brushed over with hot glue size.

At this stage all roads, the canal, the river, reservoir, aerodrome, etc., were marked in with chalk and then painted in their correct colours.

While this work was going on another group in the class was busy making the small models to place on the base. A study of our list of features showed that we should require the following types of buildings:

(*a*) Dwelling houses in roughly three types, detached, semi-detached, and long and short rows of a smaller type.

(*b*) Larger buildings, such as blocks of offices, flats, large stores, civic buildings, etc.

(*c*) Factories and works and the special shapes attached to them.

This meant that the model-making group had to be split up into three, each group making models of a particular type. It was found necessary to provide each group with its own supply of glue as well as wood and tools. The heaviest wood used was 2″ × 2″.

As the models were made one or two members of each group became responsible for painting with distemper colours. These colours dried fairly quickly with a matt surface. Windows, doors, etc., were either put in with Indian ink using a brush or were stamped on in black poster-paint with a lino-cut stamp. Several of these stamps of various sizes and patterns were made.

The finished models were placed in their positions temporarily on the base in order to keep a check on the quantity made.

As soon as sufficient models had been made assembly was started. Every model had to be glued down in its position.

When all the models were fixed the painting of all the spaces, such as fields, parks, school yards and gardens was done. This again had to be the work of a small group of boys.

The last stage was to put trees in their appropriate places. These were small pieces of loofah dyed green and cut to a size proportionate to the rest of the model, and placed in position with a little glue.

SOUTHAMPTON DOCKS

(PLATE VIII)

A PLAN of Southampton Docks was obtained and the main part drawn to scale on a piece of plywood already prepared to fit a wooden base. This outline was carefully sawn out, using both the fret-saw and tenon-saw, and then nailed to the base. The part of the base left uncovered, representing the water, was coloured blue; the "land" was painted over with a thin cement wash.

A large reproduction of a photograph taken from the air was consulted to see the disposition of the main warehouses, railways, etc., and from this also the approximate size of the buildings was fixed. It was found that printing sticks or stripwood, $\frac{3}{8}$" and $\frac{1}{4}$" square topped with triangular pieces of the same size made on the plan of the buildings in Fig. 8c, page 46, would provide warehouses of suitable size and these were quickly made and coloured.

The railway station was made of small blocks of wood with a roof of pierced cardboard lined with cellophane. Railway-lines were drawn directly on the ground in pencil.

Cranes were made by lightly driving 1" panel pins into the wood at the corners of a $\frac{3}{8}$" square, the heads pulled together and a small cube of plasticine pressed over them; a fifth panel pin stuck into the plasticine formed the jib.

Various kinds of ships were provided by the children, chiefly small-scale leaden toys. Models of famous liners, such as the *Queen Mary*, were placed in their correct docks.

A NORMAN CASTLE

(PLATE IX)

THIS model was made as large as it could conveniently be, as it was desired to place figures on it.

The scene represented in the photograph is "Rent Day at the Castle"; the free men of the village are taking their feudal dues to their lord, who is receiving them by the Great Keep.

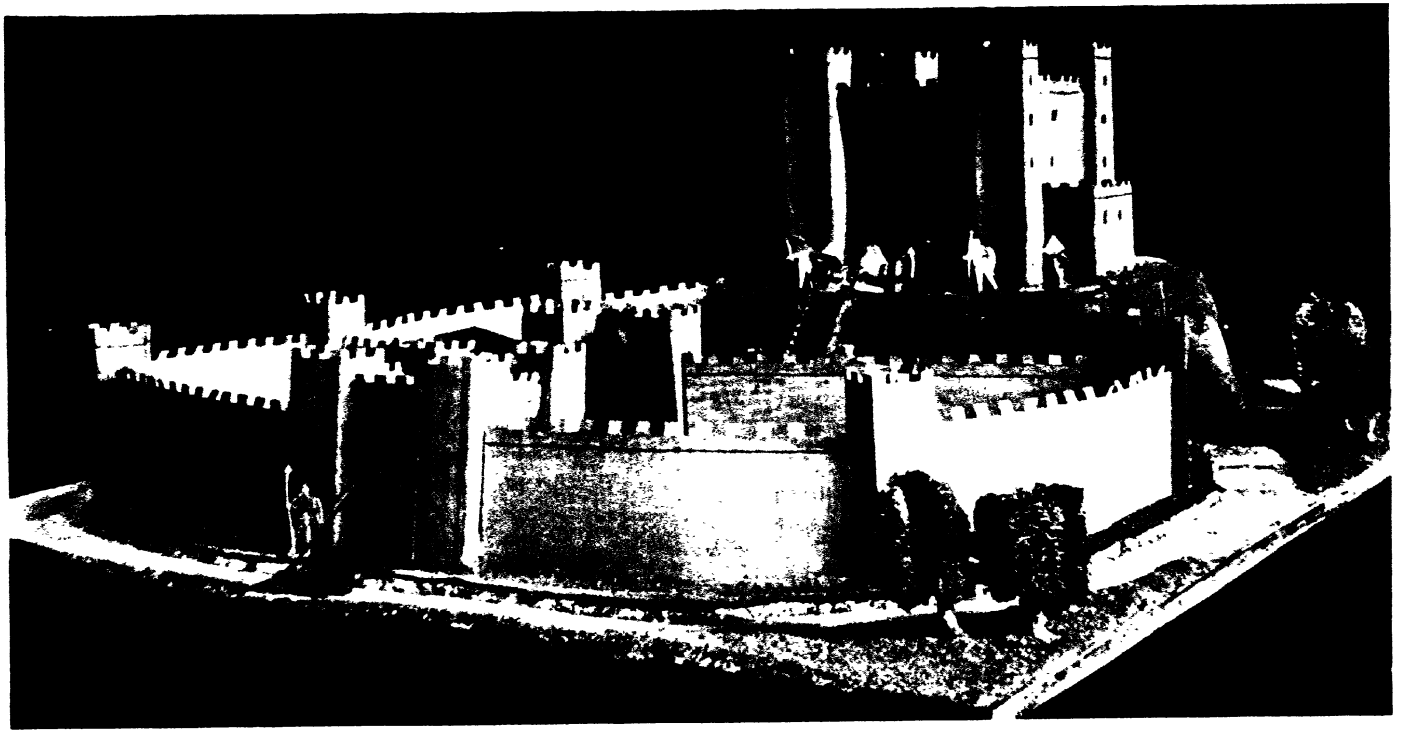
The figures were made of flat cardboard and were about three inches high (page 62).

A base 4′ × 5′ was prepared and a plan drawn and enlarged to suit this. A mound for the Keep with the ground rising towards it had to be made. As it was to be rather high and large, it was decided to make it hollow by moulding it in cardboard (see page 34). In this case the clay foundation was continued forward from the hill to form a gradual slope to the moat. The whole of this clay foundation was covered with layers of paper. When the clay was removed a very strong cardboard gave the slope required for the whole of the base right down to the moat. A small layer of papier mâché was inserted under the edge to support it and form one bank of the moat. The other was built up of papier mâché alone.

A strong cardboard box formed the main part of the Keep, and the four towers were made from taller boxes cut away to fit over the corners (Fig. 1). The Gatehouse was made in a similar way but with a smaller box as the basis and towers made from pieces of thick cardboard.

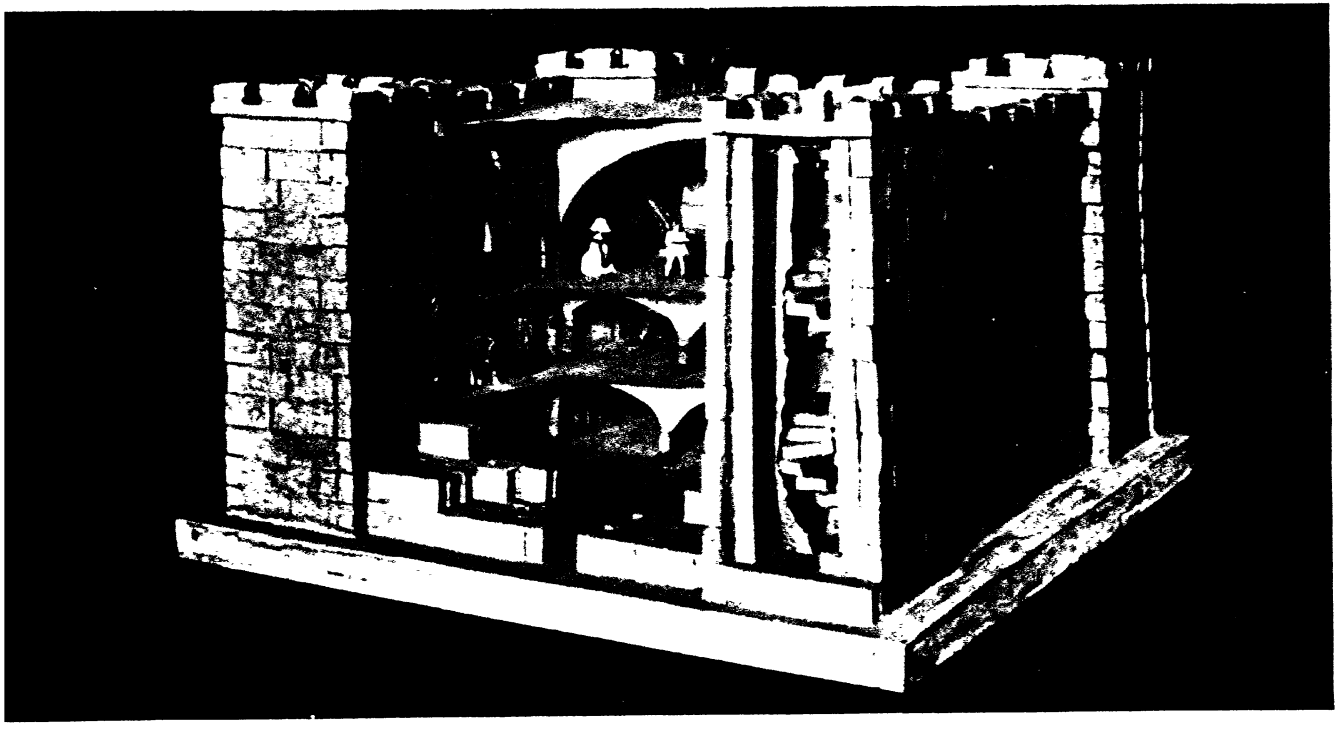
The walls were also made from thick cardboard. Crenellations were cut from long strips of thin card, which were pasted along the tops of walls, towers and keep.

All the parts were given a coating of fairly thick grey-coloured cement wash before being joined together. The ground was covered with green-dyed sawdust and the buildings were then



A NORMAN CASTLE.

This is a simple cardboard model which is suitable for the younger children to make. The scene represented is "Rent Day at the Castle." The free men of the village are presenting their feudal dues to their lord who is receiving them by the Great Keep.



A NORMAN KEEP (Exterior)

Thick walls built of interlocked match boxes give this model a really solid appearance. Note the doorways leading to the inner rooms constructed in the thickness of the walls, and on the left towards the top an opening in the gallery in the Great Hall. (see p. 94)

put in position. The steps leading up to the Keep were made of short lengths of triangular stripwood or printing sticks glued down to a strip of plywood (Fig. 2).

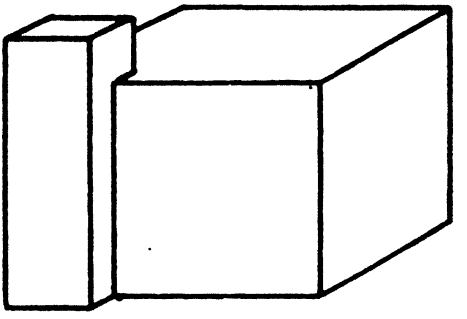


Fig. 1.

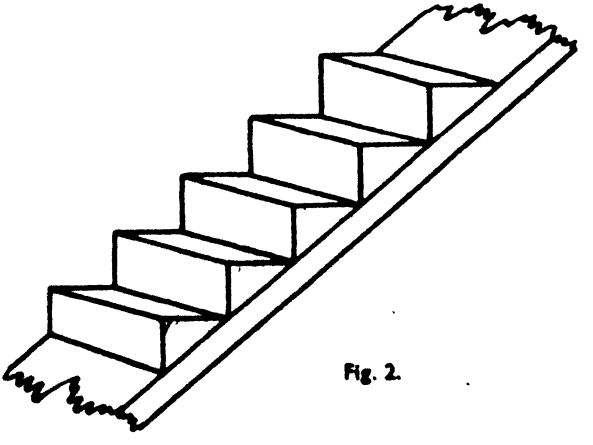


Fig. 2.

A NORMAN KEEP

(PLATE X, EXTERIOR; PLATE XI, INTERIOR)

IT was decided that this model should be big enough to show in a simple way the points that are seen when visiting ruins, i.e., the rooms in the thickness of the walls, the staircases and the shape of the windows, etc. It was hoped that the children would be led to understand the intricacies of the actual building and how some of the difficulties were overcome.

The whole was built of match-boxes with thick cardboard between the floors. Having arranged for the walls to be five match-boxes thick, placed edgewise, the measurements of a keep such as that of Rochester Castle were taken to work out an approximate scale. This would, however, have resulted in a very large model so that the actual length and breadth of the walls were considerably reduced.

The actual size ultimately decided upon for the base was 30″ × 30″.

Three sides were to be built up, the fourth being broken so that the interior would be always open to view. A ground plan is shown in Fig. 1. The match-boxes were joined together to make the required lengths of walls (Fig. 2). These lengths were then glued down to the base.

The tray of a match-box was pushed back in the centre of each wall to represent dungeons, although the children understood that these would probably be partly in the foundations below the surface of the ground and reached by a stairway. Small spaces were also made in the same way in the corners to represent doorways leading to the towers.

Three or four of the layers were then placed one above the other leaving the towers hollow until a suitable height for the ground floor was reached. Pillars of plasticine and arches of cardboard were placed in position and a number of very thin

Ground floor plan of Keep.

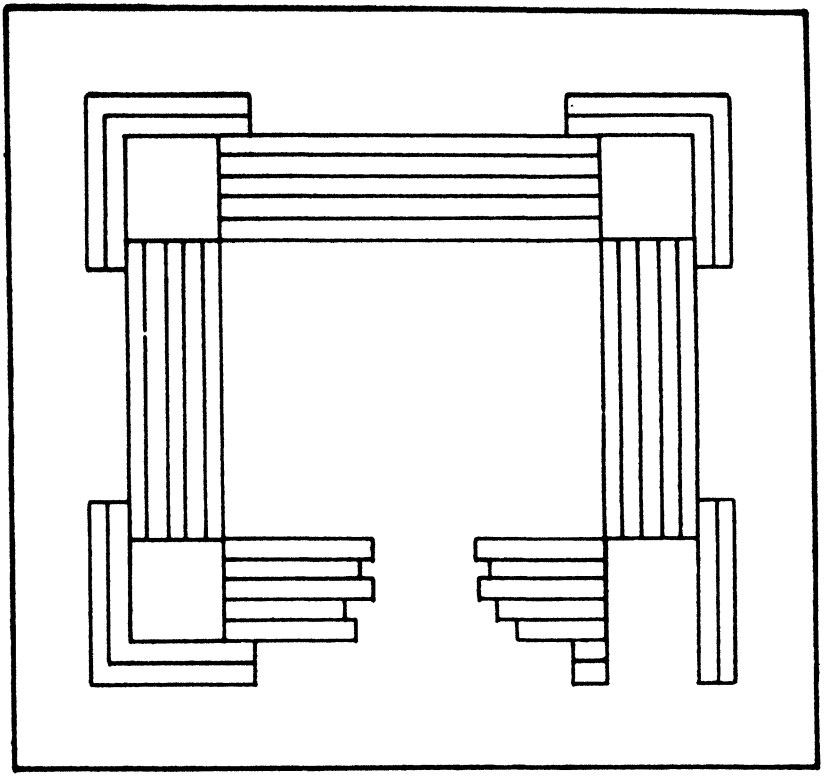


Fig. 1.

Opening left in the wall to show the interior.

strips of wood (to represent the beams that support the floor) were laid across from the walls to the arches. A piece of thick cardboard was placed over these, resting on the walls.

The next floor was then started in the same way as the first and openings for doors were made in various places, also small rooms within the walls to be entered from these doorways, by manipulating the boxes and their trays.

Small windows were also made on this floor (Fig. 3). A strip of cardboard was bent to form a curve at the top and inserted in the space, and another piece of cardboard cut with the rounded Norman arch was pasted in front of the space on the interior of the wall (Fig. 4).

This gave the appearance of a solid rounded archway as

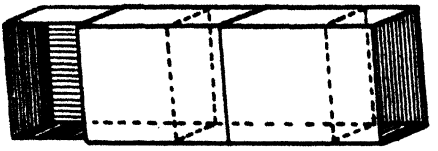


Fig. 2.

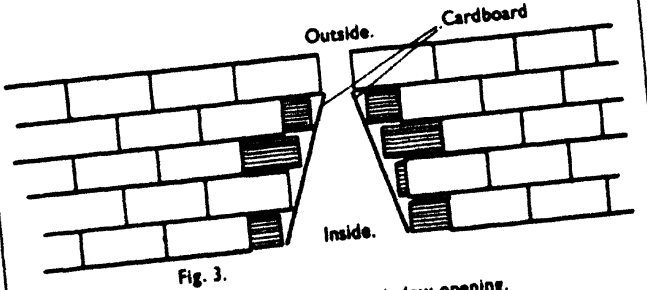


Fig. 3.

Looking down on a window opening.

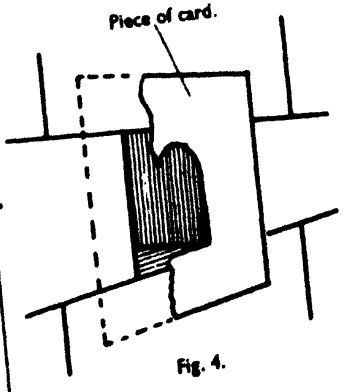


Fig. 4.

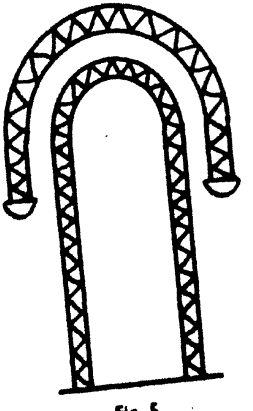


Fig. 5.

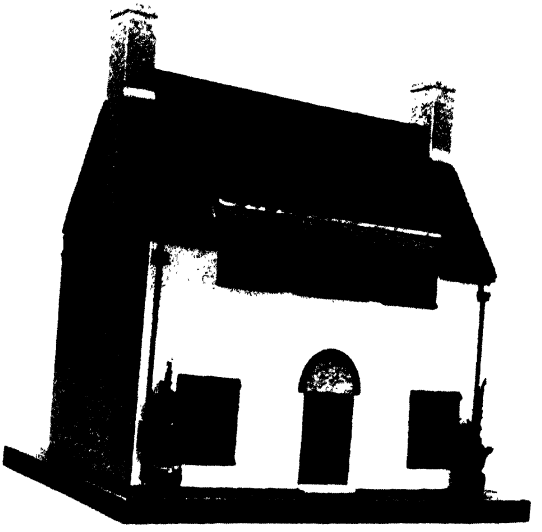
A NORMAN KEEP (Interior).

The photograph shows the gloomy interior of the Keep illustrated in Plate X. Details of the narrowing windows and the doorways can be plainly seen. A lady of the castle looks down from the gallery in the Hall on the scene below.

(see p. 94)

AN 18th CENTURY INN. with Transport Models of various periods

These are more advanced models made in wood by the older junior boys
The transport models are : a Briton's Chariot , a Saxon Cart , a Char of Mediæval Times ; a 19th Century Coach.
(see p 99.)



A MODERN HOUSE (see p. 100)

A ZOO

Here is a model which appeals particularly to the younger children and which proves a continual source of attraction for "play" when finished. The majority of the animals were modelled in plasticine, sized and coloured. (see p. 101)

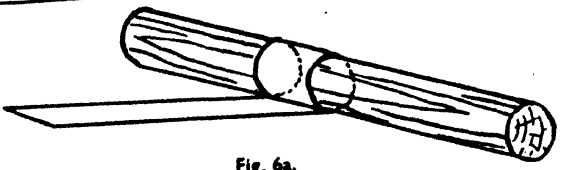


Fig. 6a.

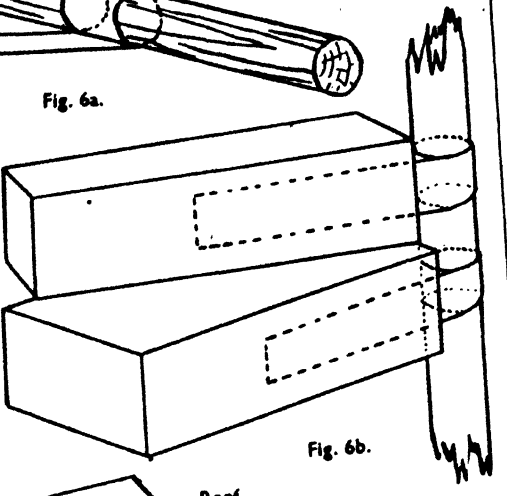


Fig. 6b.

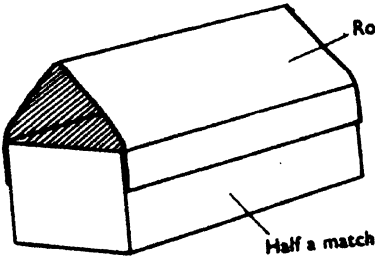


Fig. 7a.

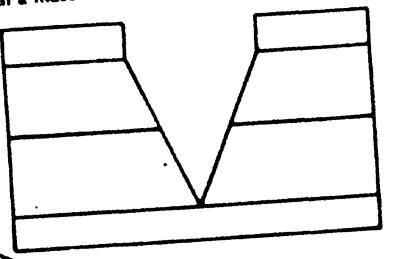


Fig. 7b.

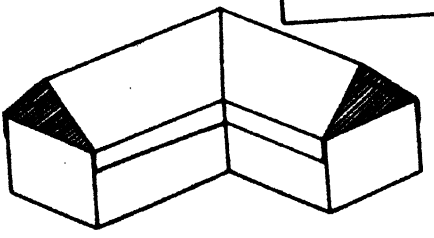


Fig. 7c.

will be seen from the photograph. Pillars, roof-arch and ceiling were made as before.

The next floor was that of the Great Hall. The photographs show quite clearly the doors and windows, larger than those on the lower floor, and with dog-tooth ornamentation made in plasticine (Fig. 5).

A gallery was made in the Hall by leaving out the second row of boxes completely and here and there making an opening in the front row.

It had been intended to build another floor. This, however, would have been practically a repetition of the first floor, and so it was omitted.

The spiral staircase was made from miniature match-boxes. A piece of ¼" dowel was cut the height of the tower and a number of thin strips of tin were partly rolled round this (Fig. 6a). The straight end of each piece of tin was then inserted down the side of a match-box. Each match-box was then swivelled round the rod until it rested in the correct position on the one below and was then glued down (Fig. 6b). This process was found to be quite easy when the dowel or rod was fixed firmly in an upright position in a vice.

A thick piece of paper the height of the towers was rolled in the form of a tube and inserted in a tower from the top to make a circular space just large enough to accommodate the staircase. The staircase was then pushed down into this tube, the front of which was afterwards cut away so as to reveal the stairs within.

A flat roof of cardboard was then laid over the walls and towers.

The battlements were made of half match-boxes roofed with thin card (Fig. 7a). The method of dealing with the corner battlements is shown in Figs. 7b and 7c. The whole building was then painted with a fairly thick, grey-coloured cement wash.

The well was made from the tops of two "Gloy" bottles. All the furniture was made from match-boxes. Pieces of tapestry were hung on the walls and in the doorway. The figures were flat cardboard shapes as described on page 62.

AN EIGHTEENTH-CENTURY INN, WITH TRANSPORT MODELS OF VARIOUS PERIODS

(PLATE XII)

THESE are more advanced models made in wood by the older Junior boys.

The Transport models are: A Briton's Chariot, A Saxon Cart, A "Char" of Mediæval Times, A 19th-Century Coach.

The animals are made of two layers of plywood as described on page 63.

The cover of the "Char" is attached to hoops of cane, the pattern on the material having been designed and potato printed by a child.

The sides of the Saxon cart are woven with raffia on panel pins.

A MODEL HOUSE—"FOUR WALLS"

(PLATE XIII)

ABOUT twelve senior boys, aged 13, actually took part in the making of this model, but the whole class were involved in its planning, and most of their problem arithmetic for a term was connected with it.

The model is a reproduction, to a scale of three-quarters of an inch to a foot (one-sixteenth full size) of the house—"Four Walls"—of which drawings are given in the arithmetic book of that name, in Trevelyan and Morley's "Functional Arithmetic" Series.

The house is constructed throughout of 6 mm. plywood, with the front and back hinged at the bottom, so as to fall outward and show the interior.

Wall and chimneys are covered with a brick-patterned paper, and the roof and gables with shingles—i.e., small wooden "tiles"—made of 0·8 mm. plywood (see page 24). Each shingle has been cut separately to size, laid in position and fixed with small nails. The "lead" flashings at the base of the chimneys, and the flat over the upper front windows, are made of tinplate.

All the internal walls, the staircase, and the fixtures are put in to the correct scale. Papering, carpeting and linoleum are all completed, and formed the starting-point for many calculations made by the class.

The house is wired for electric light, using 3·5 volt bulbs, which are run from the mains, using a small transformer.

This model is a good example of the kind of exact scale work in the making of miniature buildings which is possible with senior pupils who are reasonably competent in the use of simple woodwork tools.

ANIMAL CUTOUTS ON NATURAL BACKGROUNDS.

These pictures were made by the children who made the " Zoo " shown in Plate XIV. They provided a simple way of showing the children the natural habitat of the animals. The backgrounds were cut from coloured papers. (*see p.* 101)

A MODEL STAGE WITH SAXON HALL "SET."

Tales of heroes are sung while a feast is held in the Hall
It is possible to re-arrange the "set" at any time as the figures are flexible and can be placed in any posture. The stage is easily dismantled and can be stored flat in little space. (see p. 102

A ZOO, AND ANIMAL CUT-OUTS ON NATURAL BACKGROUNDS

(PLATES XIV AND XV)

THE model Zoo was made by children of 6 to 7 years of age. Cardboard boxes were cut to form the sections in which the animals are housed. The ponds were edged with papier mâché.

The monkey-house or cage was made of several cardboard frames pierced with holes through which grey embroidery cotton was threaded.

All the animals on the model were made by the children; most of them modelled in grey plasticine and painted as described on page 23; the remainder by free drawing and cutting of paper.

Little attempt was made on the model to place the animals in their natural environment.

This was done in the cut-out pictures shown in Plate XV. The duplicated outlines of the animals were given to the children, who cut and coloured them. The trees and grass were cut freely by the children, and the backgrounds were cut from coloured papers, the whole being mounted on large sheets of stiff paper.

A MODEL STAGE WITH SAXON HALL "SET"

(PLATE XVI)

THE stage was made by the oldest junior boys and children of 8 to 9 years of age built up the scene showing the interior of a Saxon hall.

The "set" can be rearranged at any time, as the figures are made of lead-covered electric cable (see page 66) and can be placed in any posture.

The base of the stage measures 40" × 30". The four wooden posts at the corners, the proscenium, curtain rods and curtains are all detachable, so that the whole can be packed flat and stored in little space.

Materials for the Stage:

4 mm. plywood: 30" × 40".
21" × 5" (2 pieces).
40" × 6".
1½" × 1½" (2 pieces).

1½" × ½" planed deal: 2 pieces 30" long.
2 pieces 40" long.
2 pieces 1½" long.

1" × 1" planed deal or hardwood: 4 pieces 20" long.

¼" × ¼" stripwood or other suitable light wood for curtain rods.

2 lengths of ¼" dowel rod, about 2½" long.

4 bolts, ¼" diameter, 2½" long, with washers and wing nuts. These can be bought at any large ironmonger's shop.

Making the Stage. The first step is to make the base, with an under-frame of 1½" × ½" planed deal strips placed on edge, as in the method described on page 29.

The completed base is then turned over, and the four 1" × 1" corner-posts held in the angles of the frame, and a pencil line

drawn round them, marking out the square holes next to be cut in the plywood.

Small holes are drilled in the corners of each square, and the wood within the square removed with a fret-saw. Each post should fit into its hole as accurately as possible, but so that it can be put in or withdrawn by hand—it should not be so tight as to need to be driven in with a mallet. If necessary, the holes can be made slightly larger by using a flat file (Fig 1a).

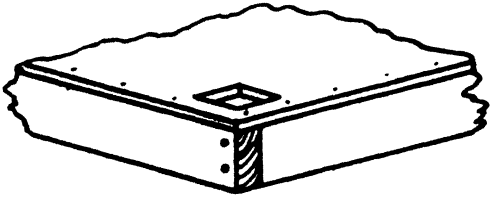
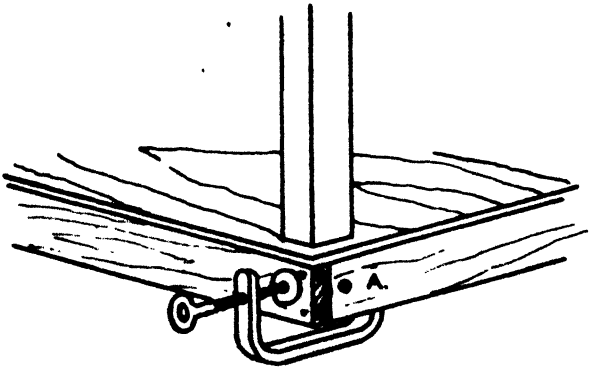


Fig. 1a.

Each post is then, in turn, placed into its appropriate hole and held tightly in position with a small fretwork cramp. While it is thus held, a $\frac{1}{4}$" hole is bored through the frame and the post, as shown in Fig. 1b. If then the cramp is removed, and one of



The corner post is held in position in the corner of the frame by a fretworker's cramp, whilst a hole is bored right through at A.

Fig. 1b.

the bolts passed through post and frame from the inside, the post can be firmly fixed by screwing up the wing nut (Fig. 1c).

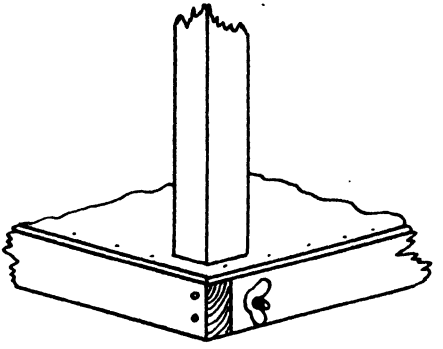


Fig. Ic.

Slots $\frac{3}{8}$" wide and $\frac{3}{4}$" deep are then cut, running from front to back at the top of each post, to take the side curtain rods, as shown in Fig. 2. This Figure also shows the method of holding

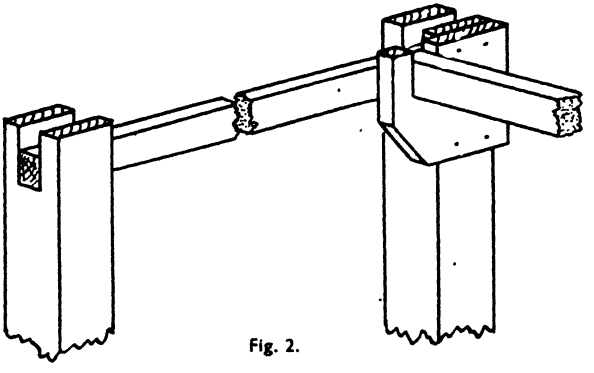


Fig. 2.

the back curtain rod. To the top of each of the two back posts is nailed a $1\frac{3}{4}$" square of plywood, cut to the shape shown in Fig. 3. The back curtain rod lies in the slots in this plywood.

The three large pieces of plywood left over (2 pieces 21" × 5" and 1 piece 40" × 6") form the proscenium. They are overlapped exactly at right angles and nailed together with $\frac{1}{2}$" panel pins.

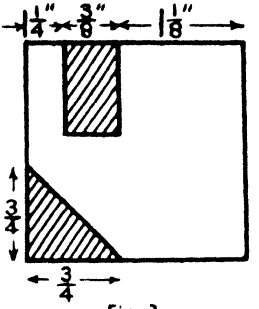


Fig. 3.

The fixing of the proscenium is made as follows:

Two pieces of ½" deal, about 1½" long, are screwed to the back of the proscenium, one at each side, about 8" from the top and in such a position that they just fit between the front posts when the proscenium is placed in position. Holes are bored through these blocks and into the posts, so that short pieces of ¼" dowel rod can be put through, thus holding the proscenium tightly against the posts (Fig. 4).

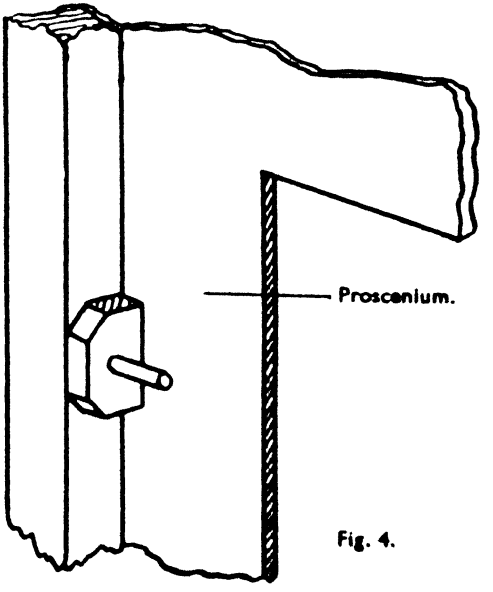


Fig. 4.

The base of the stage was stained with oak water-stain, and the proscenium front was brushed over with hot size. After the size was dry the surface was glass-papered and painted.

The pattern on the curtains was designed and potato-printed on the fabric by a child in the class.

Making the Furniture. The table and bench are made of wood. A piece of plywood is cut for each table-top and bench-top, and the position of the trestles marked (Fig. 5a).

The trestles are drawn and cut out of plywood with a fret-saw (Fig. 5b), and nailed to lengths of square stripwood placed on the sides of their upper edges (Fig. 5c). The trestles thus strengthened are glued to the undersides of the table and bench tops in the positions already marked.

Fig. 5a.

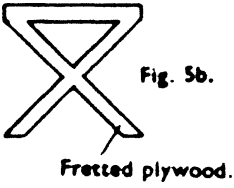


Fig. 5b.

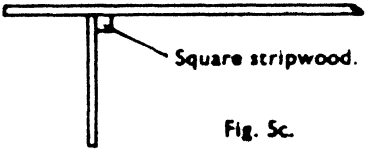


Fig. 5c.

The chairs are made of cardboard. A cube is first made to the size required for the seat. A cardboard shape is then drawn and cut out for the back and arms (Fig. 6a), scored or creased, folded to shape and pasted to the cube (Fig. 6b). When measuring round the cube for the size of the back and arms a slight allowance must be made for the thickness of the cardboard.

Various decorative patterns can then be copied from authentic pictures of Saxon chairs. These are cut out in cardboard and pasted on to the model to give the effect of carving.

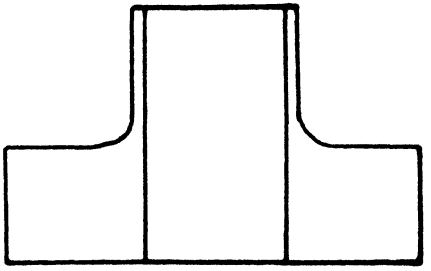


Fig. 6a.

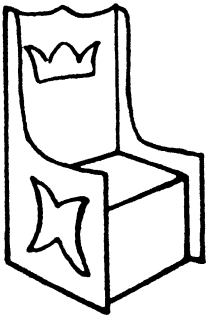


Fig. 6b.

The pottery, made in clay and painted, is again a copy of authentic Saxon specimens.

The shields are discs from milk-bottles, with a boss of plasticine in the centres.

The figures are made from lead-covered cable, as described on page 66, and have been dressed by the children in Saxon style, again with free reference to reliable pictures.

THE CANTERBURY PILGRIMS

(PLATES XVII and XVIII)

EACH of these flexible figures is made of five pipe-cleaners, as described on page 66. The horses are cut with fret-saws from plywood, and each is mounted on a grooved wooden stand.

Reference was made to reliable pictures, and to the wording of *The Canterbury Tales*, when dressing the figures.

Each figure is attached to its horse by a rubber band passed through a hole bored in the plywood in the position of the saddle.

The legs of the figure are passed through the loops thus made.

THE CANTERBURY PILGRIMS (see text).

THE CANTERBURY PILGRIMS (see p. 108)

KNIGHTS OF THE 14th AND 15th CENTURIES.

These two suits of armour were made by boys of 8 9 years of age to fit themselves. In wearing them they captured the spirit of knightly days of joust and tourney. They were copied from rubbings taken from brasses.

GEORGIAN, TUDOR AND PURITAN COSTUMES (see text).

KNIGHTS OF THE FOURTEENTH AND FIFTEENTH CENTURIES

(PLATE XIX)

BOTH these suits of armour were copied from brass rubbings. They were made by a group of boys aged 8–9 years, who fitted them on one child in the group.

The model in Plate XIXa of the armour of Sir Hugh Hastings shows the beginning of the use of plate armour. The pieces on arms and legs, and the steel cuirass under the short surcoat cover an almost complete suit of mail.

The mail for the arms, legs and body was made from very openly-woven "dishcloths." These were dyed a darkish grey, cut out and joined together. A coating of aluminium paint was then applied to the outer surface.

The camail or piece of mail round the neck was knitted in garter stitch with white knitting cotton. Eight or nine strips of knitting, about six inches long, were joined together lengthwise. Each strip was graduated in width so that a shaped collar was formed when joined, which fitted round the neck and shoulders. This was also given a coating of aluminium paint.

The plate armour for the legs, arms and feet was made of moulded cardboard.

To make this about four pieces of rough surfaced brown paper were cut to each required shape and size. (Newspapers can be used but would need more pieces.) Various articles with curved surfaces such as pails and bowls were used to mould the shape. The curved surface that would be covered with the paper

was first well greased with vaseline and one piece of paper was laid on it. The second piece of paper was then pasted and laid over the first paper. This was continued until the four papers had been used. Each different piece of plate armour was treated in the same way.

When dry, these were all removed from the moulds; a strong cardboard moulded to the correct shape had been formed. The curved roundels at armpits and elbows were made similarly.

To fix all these to the figure thin leather straps were joined to the cardboard with paper-fasteners.

The basinet was moulded on a football resting on a plant-pot. Small pieces of torn paper were used, not more than a few inches in size. They were placed overlapping on the football (leaving a space for the face) and about an inch or so down the sides of the plant-pot. The first layer was well pasted and a second layer placed in position. This was continued for about four layers. This method is described on page 34, for moulding the shape of a hill. The shield was cut from flat cardboard and made to curve by a strap on the inner side.

All these pieces of cardboard representing plate armour were given a good application of aluminium paint.

The coat-of-arms on both surcoat and shield was cut out in blue poster paper and pasted on the material and cardboard. The design was traced from the brass rubbings.

The later suit of armour in Plate XIX shows the cuirass of steel as the surcoat has disappeared. This was made of two pieces of strawboard for back and front cut to shape like a close fitting bodice. It was made to curve slightly by cutting slits at the waist and shoulders and overlapping the cut edges.

To this were joined pieces of cardboard moulded as before to form the taces, which were joined to each other by paper-fasteners.

Small pieces of cardboard were joined together slightly overlapping in the same way as the taces to form the pauldrons on the shoulders. The basinet was made as for the former model, and a shaped collar of plate circled the neck instead of the chain-mail camail.

TUDOR, PURITAN AND GEORGIAN FIGURES

(PLATE XX)

THE beautiful finish and fine detail to be seen in the dressing of these figures show what advances in model-making may be expected when the work is carried out by senior children.

The foundation figures are made of lead-covered electric cable, and are the same as those used for the Saxon Hall "set" shown in Plate XVI.

Authoritative books on historical costume were used for reference when making the dresses.

LIST OF TOOLS AND MATERIALS USED IN MODEL-MAKING

TOOLS

Awl, bookbinder's.
Bradawls, carpenter's: $\frac{1}{16}$" and $\frac{1}{32}$" blades.
Brushes, flat short bristle, $\frac{3}{8}$" and $\frac{1}{2}$", as used for stick printing.
,, flat varnish, 1" and 1½".
,, round camel-hair, various sizes as used in art work.
Card cutter (guillotine).
Drill, Archimedean, as used for fretwork.
Drill bits for above, various small sizes.
Fretsaw blades, No. 6 coarse.
,, frames, 9" and 12".
,, cutting table and cramp.
File, flat, 2nd cut, 8", handled.
,, half-round, 2nd cut, 8", handled.
Files, 5" or 6" fretwork, half-round, round, square, triangular.
Hammer, light pin, as used for toymaking.
Modelling tools, for clay.
Pincers, tower pattern, 7".
Pliers, round-nosed, 4½".
,, side-cutting, 5".
Ruler, boxwood, graduated English measurements.
Sawing boards ("bench hooks").
Saw, brass back, 5", straight handle, 21 point.
,, tenon, 10".
Scissors, round ends, 4½" or 6".
Straight-edge, 12", as used for book crafts.
Try-square, 3" or 4½".

MATERIALS

Note. There are many references in the text of this book to various forms of "waste" materials which will be found useful in model-making. In addition, the following materials may at times need to be purchased:

Cane, round pulp, sizes 1 to 3.

Cardboard: strawboard, 10 oz., 12 oz., 16 oz.
„ white, 3-sheet and 6-sheet.
Cellophane, wrapping thickness.
Celluloid, sheet, transparent, 0·01″ thick.
Cement, Portland, grey.
Clay, modelling, grey.
Dowel rods, birch or beech, ¼″, ⅜″ and ½″ diameter.
Dyes, cold-water, various colours.
Glasspaper, No. 1, Fine 2 and Middle 2.
Glue: Liquid, preferably in tubes.
„ Scotch.
Loofahs.
Nails: Fretwork, steel, ½″, ½″, ¾″.
„ Oval, 1″, 1½″.
„ Panel pins, fine or medium, 1″, 1½″.
Paper, various kinds as used in art and book-crafts.
Paper fasteners, brass, small, medium and large.
Paste powder, cold water.
Paint: dry powder or tempera colours.
„ enamel, quick-drying.
„ oil, decorator's.
„ poster colours.
„ water colours, tablets and tubes.
Plasticine, various colours.
Plywood: alder 1½ millimetre.
„ birch, 3, 4, 5 and 6 millimetre.
Raffia, natural and coloured.
Sand, silver.
Size, concentrated powder.
Towelling, turkish.
Turpentine.
Wood: hazel pine strips, fine sawn, 3 ft. lengths; various sizes.
„ printing sticks, 3″ lengths, various shapes and sizes.
„ red deal strips, planed, various sizes.
Wool, knitting and weaving, 3-ply and 4-ply.

INDEX

N.B.—References to actual Models are printed in small capitals.

SOME BOOKS OF REFERENCE

TITLE	AUTHOR	PUBLISHER
A History of Everyday Things in England	Quennell	Batsford
Everyday Life in Anglo-Saxon, Viking, and Norman Times	Quennell	Batsford
Everyday Things in Classical Greece	Quennell	Batsford
The Piers Plowman Social and Economic Histories		Philip
Piers Plowman Social History Books 4 and 5		Philip
English Costume	Dion Clayton Calthrop	Black
A History of Costume	Kohnel	Harrap

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